december 1958

nlgi spokesman

journal of the national lubricating grease institute

NLGI Elects F. E. Rosenstiehl the 26th President

President's Address – 1958
By R. CUBICCIOTTI

Market Potential for Automotive Grease
By W. M. DROUT, JR., and N. L. JENKINS

Needed – New Driver Attitudes
By H. A. MAYOR, JR.

Development of Extreme Pressure Greases
By DR. R. K. SMITH

"In 30 months...not a single bearing lubrication failure with lithium-base grease!"

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Pan Conveyor handling hot clinker (1600°F), roller bearings in dusty, moist atmosphere.

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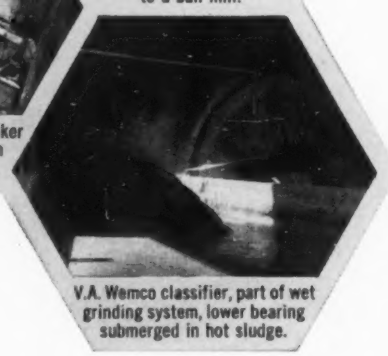

V.A. Wemco classifier, part of wet grinding system, lower bearing submerged in hot sludge.

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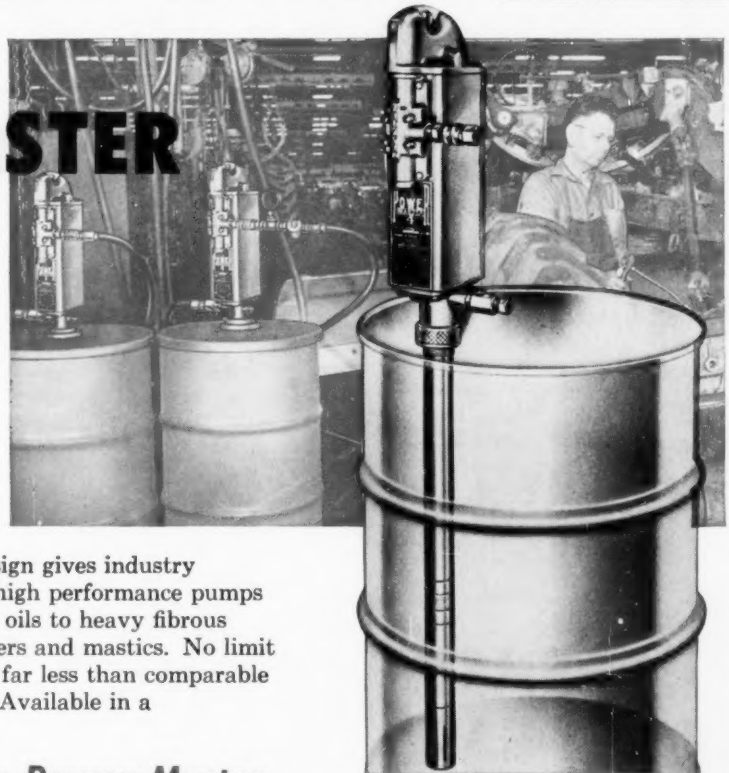

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Power-Master . . . years-ahead design gives industry a complete range of dependable, high performance pumps to handle all materials from light oils to heavy fibrous greases and viscous coatings, sealers and mastics. No limit to industrial applications . . . cost far less than comparable pumps to operate and maintain. Available in a great number of pressure ratios.

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INDUSTRY-WIDE APPLICATIONS—**Five Pump Tubes** are available for the POWER-MASTER series providing 19 ratios from 2 to 1, to 75 to 1. Meets all Industrial requirements. Handles all materials, from light, volatile solvents to heavy mastics.

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Future Meetings

JANUARY, 1959

25-27 ASLE gear symposium, Hotel Morrison, Chicago.

FEBRUARY, 1959

2-6 ASTM National Meeting, William Penn Hotel, Pittsburgh, Pa.

16-17 Packaging Institute, Petroleum Packaging Committee, Goodhue Hotel, Port Arthur, Texas.

26-27 API Division of Marketing, Lubrication Committee Meeting.

***MARCH, 1959**

3-5 SAE Passenger Car, Body, and Materials Meeting, Sheraton-Cadillac, Detroit, Mich.

APRIL, 1959

15-17 National Petroleum Association, Semiannual Meeting.

21-23 ASLE Annual Meeting and Exhibit, Hotel Statler, Buffalo, New York.

MAY, 1959

4-6 API Division of Marketing, Lubrication Committee Meeting.

15-24 International Petroleum Exposition

27-29 API Division of Marketing, Midyear Meeting.

31-June 6 Fifth World Petroleum Congress.

JUNE, 1959

14-19 SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

* Tentative

OCTOBER, 1959

26-28 NLGI Annual Meeting, Roosevelt Hotel, New Orleans, La.

APRIL, 1960

19-21 ASLE Annual Meeting and Exhibit, Netherland-Hilton Hotel, Cincinnati, Ohio.

JUNE, 1960

19-21 ASLE Annual Meeting and Exhibit, Netherland-Hilton Hotel, Cincinnati, Ohio.

nlgi spokesman

Published Monthly by the National Lubricating Grease Institute, T. W. H. MILLER, Editor; SUSANN SNYDER, Assistant Editor, 4638 J. C. Nichols Parkway, Kansas City 12, Missouri. Telephone: VAlentine 1-6771. 1 Year Subscription, $5.00. 1 Year Subscription (Foreign), $6.00

IN THIS ISSUE

Future Meetings 406

News About NLGI 410

President's Page 414

NLGI Elects F. E. Rosenstiehl the 26th President 417

President's Address—1958 419

Market Potential for Automotive Grease 427
By W. M. Drout, Jr. and N. L. Jenkins, Esso Standard Oil Co.

Needed—New Driver Attitudes 431
By H. A. Mayor, Jr., Southwest Grease & Oil Co., Inc.

Development of Extreme Pressure Greases 435
By Dr. R. K. Smith, E. F. Houghton and Company

Literature and Patent Abstracts 440

People in the Industry 446

Industry News 452

THE COVER

New presidents of the Institute are traditionally featured on the December cover of the NLGI Spokesman, and it is our pleasure to present the 26th chief executive of the organization . . . Mr. F. E. Rosenstiehl, of the Texas company. Fred has long been active in affairs of NLGI and has a thorough background of the aims and principles of the group. Here he is shown accepting the gavel at the banquet of the annual meeting and for a closer look at the new president, why not turn to his biography, which is featured on page 417 of this issue.

News About NLGI

Second Annual Survey

There will be an NLGI survey on the production of lubricating greases and fluid gear lubricants for the year 1958—the unanimous decisions by the Board of Directors sets the stage for the *second* annual gathering of production data by the Institute.

The first survey, conducted early this year on 1957's production, showed a heartening 76 per cent return of the membership polled. Figures released last spring indicated that the 48 companies replying via questionnaire manufactured over one billion pounds of lubricating greases and fluid gear lubricants. Production figures were used to prevent the possible duplication that sale and re-sale might bring if marketing totals were employed.

Because the history of surveys is to gain more participation with each year, the Institutes' board of directors feels that a compilation of 1958 statistics will provide an even more accurate total—one that with the 1957 total, will begin to be of historic significance. NLGI Active (manufacturing) member firms in the United States may be joined by a separate survey for Active members in Canada, who have asked that all be polled for interest in participation. If Canadians do participate, their procedures will be identical to those of United States members but a separate, Canadian total will be listed on the final tabulation.

Procedures used for the 1957 survey will be duplicated for the 1958 . . . the stress will be on anonymity and elaborate safeguards will be taken to insure complete secrecy of data. These steps include:

1. The survey is conducted entirely by the management services division of the nationwide accounting firm of Ernst & Ernst . . . no one connected with the Institute in any fashion works on the survey, other than to receive the certified total.
2. There is no identification, coding, numbers or marking on any questionnaire.
3. Questionnaires are sent to members by certified mail from the gathering agency with a return envelope enclosed, complete with postage, for returning the questionaire by registered mail to Ernst & Ernst.
4. Only totals are reported to NLGI . . . they are certified by the accounting firm as to the accuracy and secrecy . . . all replies are destroyed after the tabulation has been completed.

Following last year's schedule, sample questionaires for orientation will be mailed out in December, followed by the Ernst & Ernst mailing of actual report sheets, in January. The closing date will be March 31, 1959.

Distribution of Ernst & Ernst final reports will be made by the national office to *all* catagories of membership (Active, Associate, Marketing and Technical) in late April. Mr. W. H. Saunders, Jr., president of International Lubricants corporation, New Orleans, is chairman of the 1958 survey committee. Mr. Saunders, a founder of NLGI, is a past president (1935-36) and presently a director of the Institute. Serving on the committee are Mr. F. R. Hart of Standard Oil (California), Mr. G. Landis of Atlantic and Mr. G. E. Merkle of Fiske Brothers, all NLGI directors.

Brunstrum Given Award for Achievement

L. C. "Larry" Brunstrum, technical representative from Standard Oil company (Indiana) and a vice-chairman of the Institute's technical committee, was awarded the NLGI "Award for Achievement" at the recent annual meeting. He is the seventh man in Institute history to receive this recognition.

Aiding and implementing the progress of the organization's technical group as a participant for many years and since 1955 as one of two vice chairmen, Brunstrum has also authored several papers in the NLGI Spokesman. More re-

Continued on page 412

Continental puts extra service into every steel container

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Continental gives you the highest quality steel containers *plus* the benefits of famous Continental service. You deal with a Continental expert who knows the problems of the petroleum industry. You order from a complete line of steel containers, superbly lithographed for powerful sales appeal. You get fast delivery of all the containers you need, when you need them. And if you have a special problem, Continental's research and engineering services help you solve it. Let us show you what we mean by famous Continental service. Call today.

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BONER'S BOOK—Manufacture and Application of Lubricating Greases, by C. J. Boner. This giant, 982-page book with 23 chapters dealing with every phase of lubricating greases is a must for everyone who uses, manufactures or sells grease lubricants. A great deal of practical value. $18.50, prepaid.

VOLUME XX — Bound volume of the NLGI SPOKESMAN from April, 1956 through March, 1957. An excellent reference source, sturdily bound in a handsome green cover . . . $7.00 (NLGI member price) and $10.00 (non-member) plus postage.

Continued from page 410

cently, he instituted a study of technical committee organization. Recognition was made by the awards committee and the board of directors, with the presentation taking place during the banquet of the annual meeting.

Other recipients of the award include G. W. Miller (Battenfeld of New York), T. G. Roehner (Socony Mobil), B. B. Farrington (California Research), H. M. Fraser (International Lubricant), C. J. Boner (Battenfeld of Kansas City), and M. B. Chittick (Pure).

Sharrah Is Representative

Continental Oil company has named Dr. M. L. Sharrah as NLGI's company representative. Dr. Sharrah was recently promoted to manager of this Active member firm's research and development department.

M. J. Pohorilla of the Kendall Refining company has been named the second vice chairman of NLGI's Technical committee. "Mike" has been active in Institute affairs for many years in his capacity as both company and technical representative for his firm. He succeeds E. W. Nelson of Continental Oil company, and will work with L. C. Brunstrum of Standard Oil (Indiana), vice chairman, and T. G. Roehner of Socony Mobil, chirman of the Technical Committee.

General Manager Awarded Certificate

A certificate of graduation for the basic course at the institute for organization management has been awarded T. W. H. Miller, general manager of NLGI. He attended Michigan State university for three summer sessions, taking a concentrated training program in the management of associations.

The course is sponsored by the Chamber of Commerce of the United States and is aimed to equip the executive with the techniques and methods of management.

NLGI PRESIDENT'S PAGE

By F. E. ROSENSTIEHL, *President*

Friendship Through the Years

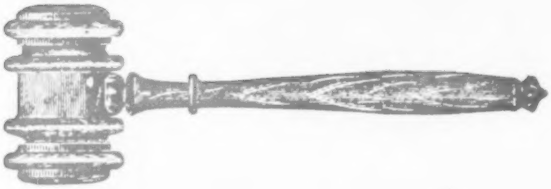
From all reports, the NLGI annual meeting in October was a great success. Some 400-odd members and guests attended the three-day meetings and participated in some of the most interesting and informative sessions I think we have had to date on the problems and future prospects of the lubricating industry.

I am sure that all of us gained a good deal of valuable information on the technical, marketing and manufacturing progress of our industry. But I think we also carried away from the meeting something else, something less tangible perhaps, but just as real, and that was the warm satisfaction of renewing old acquaintances and making new ones.

It seems to me that perhaps we have not emphasized enough this aspect of an association like NLGI in our solicitation and welcoming of new members. Certainly in our national annual meeting there is a widening of personal acquaintances that extends beyond those normally made in the course of daily business association. There is a development of important contacts, a broadening of our own personal horizons and vision, and healthy exposure to men of other areas and other ideas. And there is the friendship that grows up through the years and which has helped to make NLGI the growing and living organization it is.

For my part, the October annual meeting was a rewarding and constructive experience. I sincerely hope that it was the same for all of you who attended:

On behalf of the Board of Directors, I extend to all a Merry Christmas and a prosperous, healthy, happy New Year. ■



NLGI Elects F. E. Rosenstiehl the 26th President

The 26th president of the National Lubricating Grease Institute—Mr. F. E. Rosenstiehl, offers a wealth of experience in the world of lubrication and in the affairs of NLGI. Elected as chief executive of the organization at the Institute's annual meeting in Chicago last month, "Fred" has served the petroleum industry for 41 years and has represented Texaco on the NLGI board since 1950.

A graduate of the Pratt Institute and Brooklyn Polytechnic Institute, he joined the Texas company in 1918 at its Bayonne, New Jersey laboratory, later becoming chemist in charge of the analytical and testing department there. He was transferred to the New York office of the technical and research division in 1929 and became supervisor of technical service in 1938. Mr. Rosenstiehl was named assistant manager of the division in charge of technical service activities in 1942, assistant manager of the lubrication sales division of the domestic sales department in 1949. He was appointed manager of lubrication sales in 1950 and last month was named sales manager, product development and control, for Texaco.

In the years he has been associated with the petroleum industry, he has closely followed testing and application of all types of petroleum products. He has prepared numerous papers and talks covering the application of petroleum products and technical phases of their manufacture. In addition, he has been active in a consulting capacity on petroleum to many federal, state and industrial groups. Mr. Rosenstiehl also has obtained patents covering the composition of lubricants.

A former chairman of the lubrication committee, marketing division, the American Petroleum Institute, Mr. Rosenstiehl belongs to ASTM, ASME, SAE, the Union League and the Chemists' clubs. As an NLGI board member he has served on or chairmanned every operational committee, more recently serving as vice president of NLGI and chairman of the 1958 annual meeting program committee.

Mr. and Mrs. Rosenstiehl reside in Westfield, New Jersey, where both are active in a number of church and civic activities.

PRESIDENT'S ADDRESS—1958

Remarks by the 25th President of the National Lubricating Grease Institute at the Annual Meeting, Chicago, Ill.

By: R. Cubicciotti

Immediate Past President, NLGI

WELCOME TO THIS, the 26th Annual Meeting of the National Lubricating Grease Institute. We are happy to have you present to help us launch our Institute on its second quarter-century of service to those interested in the development, manufacture, sale and application of lubricating greases, with all the attendant implications in the fields of raw materials, manufacturing equipment, packaging, dispensing, and consuming equipment.

To build better for the next 25 years, a glance at the 25 years just passed should prove of value. Some twenty-five years ago a small group of men met in Chicago to form a new association. Who were they? They were representatives of a group of independent lubricating grease manufacturers.

What did they call themselves? The National Association of Lubricating Grease Manufacturers, Inc., later to be changed to the National Lubricating Grease Institute.

What were their objectives? As stated by the founders, the purpose was to disseminate technical information regarding the manufacture and application of lubricating greases.

That they planned soundly and built a strong foundation there is no doubt. The Institute has grown mightily in the intervening years, thanks to that firm foundation.

One measure of that growth lies in our roster of members, over 150 in number. It is in recognition of that growth that our Constitution and By-Laws were revised during the past month, primarily to afford increased representation on our Board of Directors to more of the fine companies willing and anxious to share in the labors of the Institute.

Another measure of that growth is implicit in the Survey of Lubricating Grease Manufacture, recently completed, and which shows that our members make substantially more than a billion pounds of grease each year, a subject to which I will revert later.

And now for a very special look at 1958, with perhaps a forward glance or two into the future.

In doing so, I am mindful of the Institute's manifold interests, ranging from research and manufacturing, through packaging, marketing and application, and on to public relations, by which we set great store.

Research

One of the objectives of NLGI is to stimulate research leading to improved lubricating greases that would keep our industry in step with the program of research in other industries. You will agree that continuous research, and particularly basic research, is essential if the grease industry is to remain progressive and respond to its responsibilities.

A mere reading of the titles of some of the papers to be presented at these meetings gives further evi-

NLGI award for achievement, an engraved silver tray, is made by Cubicciotti to L. C. Brunstrum, for his many accomplishments as vice chairman of the technical committee.

OFFICERS for 1958-59 include A. J. Daniel as treasurer, F. E. Rosenstiehl as president, J. V. Starr as secretary, and H. A. Mayor, Jr., as vice president. They represent Battenfeld (Kansas City), Texaco, Esso and Southwest.

dence of our deep interest in research, such as:

- A Preformed Organic Thickener
- Gas Chromatography for Analysis of Fatty Acids
- Development of Extreme Pressure Greases
- An Equation Fitting the Flow of Lubricating Grease in Viscometers and Pipes
- Yield Point of Lubricating Greases
- Pressure and Temperature Effects on the Flow Properties of Grease.
- Comparison of Temperature Effects on the Flow Properties of Greases in Capillary and in Cone and Plate Viscometers

NLGI Fellowship

Another concrete example of NLGI's interest is the NLGI Research Fellowship supported at the University of Southern California for a number of years and for the last few years at the University of Utah. At the latter it has been under the direction of Dr. Henry Eyring, dean of the graduate school, University of Utah, who is an international authority on rheology. The importance of lubricating greases as lubricants stems primarily from their rheological flow properties or, more specifically, to their ability to "stay put" in bearings where lubricating oils would show excessive leakage. It is logical, therefore, that an understanding of the fundamentals of that property is of immediate interest. The results obtained by the NLGI research fellow are published in the NLGI SPOKESMAN and so made available not only to NLGI members but also to research laboratories of users of lubricating greases.

During these meetings, you will have the opportunity to hear Dr. Eyring report in person on the progress of the work being done at the University of Utah.

Technical Committee

A very vital activity of the Institute centers in its large and active Technical Committee. Many of you will attend its sessions tomorrow afternoon and Wednesday morning, and there you will gain an impression of its wide ranging interests. Of course, you realize that our Technical Committee also played a major part in the selection of several of the papers which will be presented at other times during these sessions.

Especially worthy of note are the several sub-committees of the Technical Committee. A listing of their names not only serves to remind you of the problems which are under their scrutiny, but it also serves to pay our respects to these very hard-working groups:

NEW board members of NLGI include A. S. Randak, W. A. Magie II, A. G. Griswold, E. W. Campbell, T. F. Shaffer, T. W. Binfold and S. C. M. Ambler. These men are the company representatives of Sinclair, Magie Brothers, Cities Service, Gulf, Shell, D-A Lubricants and British American, respectively. This year, the board was enlarged by three.

NLGI Classification of Lubricating Greases

Manual of Test Methods and Definitions of Terms Peculiar to the Lubricating Grease Industry

Recommended Practices for Packing Automotive Front Wheel Bearings

Delivery Characteristics of Dispensing Equipment for Lubricating Greases

Fundamental Research

Literature and Patent Abstracts

One specialized field of research has to do with a constant survey of patents in the field of lubricating greases.

For many years, a feature of the NLGI *Spokesman* has been an article entitled "Patents and Developments." I am happy to announce that we just completed arrangements with Mr. Charles Boner, author of "Manufacture and Application of Lubricating Greases" and a leading authority in the field, to write a regular department in the journal with articles about the field of lubricating grease patents.

Production

The absorption of the Institute in matters having to do with manufacturing is also indicated by the titles of some papers which are to be given at these meetings, for example:

Milling of Grease

The Mechanisms of Dispersion

Facts and Factors in Grease Manufacturing Costs

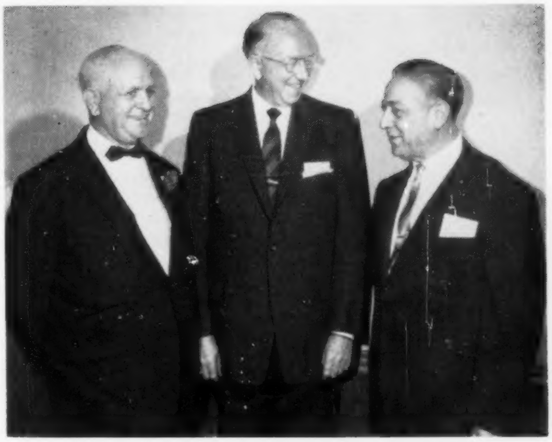
Production Survey

Certainly manufacturers of lubricating greases and fluid gear oils engage in continuous laboratory and field testing, but often individual firms cannot gather specific data on industry-wide problems. Since there are certain kinds of data which can be supplied properly for the benefit of industry as a whole and as a service to its individual members, the feeling grew among members of the National Lubricating Grease Institute that a survey of production—of the pounds produced in a calendar year would be a valuable contribution to industry research.

After several years of discussion, the Board of Directors felt that there was sufficient interest to conduct a survey of lubricating greases and fluid gear lubricants based on production for the year 1957. A committee was appointed to establish a procedure which would be satisfactory to all. Several agencies were considered to make this survey, including various government agencies, the A. P. I., trade publications, etc. It was finally decided that this function should be carried out by the services division of the certified public accounting firm of Ernst and Ernst.

Several points were agreed upon:

1. The survey should be based on production rather than on sales because in the case of the latter data there is frequent opportunity for duplication.

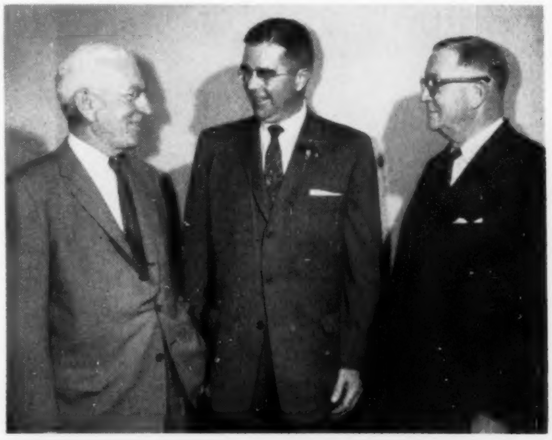


RE-ELECTED to the board were C. L. Johnson, F. R. Hart and R. Cubicciotti, who with H. A. Mayor, Jr., represent Jesco, Standard (California), Sonneborn and Southwest.

2. It was stressed that in reporting the figures, members should be guided by the following A. S. T. M. definition for lubricating grease:

"Lubricating Grease—a solid to semifluid product of dispersion of a thickening agent in a liquid lubricant. Other ingredients imparting special properties may be included." The definition therefore excludes compounded and blended oils, process oils, soluble oils, etc. which often are produced in a "grease" plant.

3. It was agreed that production should be reported by the type of thickener, including aluminum soap, calcium soap, lithium soap, sodium soap, "other soap" and nonsoap (inorganic thickener). Greases containing two or more thickeners were listed under the category whose characteristics predominated.



RETIRING board members B. G. Symon, H. P. Ferguson and D. P. Clark. Not shown is H. L. Hemmingway, who with Symon, has been a past president of the Grease Institute.

4. The finalized plans assured that the statistics would be in the nature of a summary, and the data from each reporting member were to be submerged in the totals. A careful effort was made to preserve anonymity and since Ernst & Ernst had been selected to conduct this survey on the basis of similar work for other technical organizations, all mailings came from and were directed to this outside agency.

With National Lubricating Grease Institute's extensive representation among lubricating manufacturers in the United States (unofficially estimated at 95 per cent of all domestic production) it was felt that this industry-wide data would also have many advantages for other member classifications of the Institute. Suppliers of manufacturing and dispensing equipment, containers, ingredients, and marketing organizations can all utilize this information, and should find it valuable.

A total of 63 active members received questionnaires by registered mail early in 1958. Replies received by the end of March totaled 48, or 76.2 per cent of the membership originally polled. This was considered to be an excellent return in view of the fact that a survey of this type was just being introduced. Three classifications were made of the results by the gathering agency as follows:

Producing less than one million pounds per year, between one million and five million pounds per year, and over five million pounds per year.

Manufacturers reporting production of less than one million pounds numbered eleven, while in the one to five million area 14 firms replied. Twenty-three members reported production of over five million pounds. Based on known facilities, the reporting companies would seem to be in the main the primary producers. An informal estimate placed the total at approximately 85 per cent of the total domestic production.

PURE research session, featuring Dean Henry Eyring of Utah university, here discussing rheology. Dr. Eyring supervises the NLGI research fellowship program at Utah.

Summary of Total Pounds Produced

	Pounds Produced	*Per Cent*
A. *Lubricating Greases*		
1. Aluminum Soap	27,142,543	4.6
2. Calcium Soap	218,844,369	37.7
3. Lithium Soap	160,462,383	27.5
4. Sodium Soap	128,859,083	22.2
5. Other Soap	28,680,446	4.9
6. Non-Soap (Inorganic Thickener)	17,891,004	3.1
Grand Total of Lubricating Greases	581,879,828	100.00
B. *Total Pounds of Fluid Gear Lubricants Produced*	473,999,270	
C. *Grand Total*	1,055,879,098	

Production figures for only one year are not too meaningful. However, the Directors feel that this survey has been of value to many members and plan to continue this service.

Packaging

Another fruitful area of Institute activity concerns itself with the packaging of the products. In this regard, we are fortunate in including among our Associate Members many manufacturers of packages. We maintain active liaison with the Packaging Institute, as well as the American Standards association and we are sponsors of the NLGI-API joint container committee.

During the year just passed this group has cooperated in getting ready for publication standards on some ten drums and pails, and in getting before American Standards Association, for its consideration, tentative standards on some 13 shipping cases.

Other fields of activity for this group have included studies of combination fibre and metal cans, plastic film packages, fibreboard drums, and grease cartridges.

Marketing

Perhaps our greatest service is rendered in the field of marketing.

Sensing a need for an educational film on lubricating grease, your Institute authorized the production of a sound-color movie entitled "Grease—the Magic Film." It had its premiere at our meeting just a year ago and since that time we have sold some 80 copies. Hundreds of showing have been held, many in foreign countries, and the understanding of lubrication by means of lubricating grease has been considerably enhanced. The Institute has gladly subsidized this venture in order to keep the cost of the film to members and others at a minimum.

I am also glad to report that the plates used to print the booklet entitled "Recommended Practices for Lubricating Automotive Front Wheel Bearings" are worn out because over 100,000 copies have been printed and distributed at nominal cost.

In a similar way, a booklet entitled "Recommended

Practice for the Lubrication of Passenger Car Ball Joint Suspensions" is in the course of preparation and should soon be available.

As the readers of this column know very well, your Institute is concerned about the declining frequency of automobile chassis lubrication jobs and it has a committee studying ways and means of combating this tendency.

How do we instill in people a feeling of the importance of regular lubrication in the maintenance of their automobiles?

How can we impress upon the average car owner the need of imitating the careful maintenance habits that prevail in successful industrial establishments?

This is the challenge that faces every member of the lubricating grease industry. How well we meet that challenge will determine how much we can increase the sale of our product.

Industry has learned the need for proper maintenance. Each department in a properly run organization is billed for any loss resulting from improper care. The costs of inefficiency are therefore quite apparent to anyone in any given department.

The average owner of an automobile, however, does not operate his vehicle on such a basis that the cost of early slipshod maintenance is either immediately apparent or called automatically and forcefully to his attention.

On the contrary, it might even seem logical for him to assume that by skipping a lubrication job or two he might be saving on upkeep. How can we educate such people to the necessity of regular lubrication for cars no matter how new or old?

Perhaps the answer is contained in a letter I received recently from a friend. Among other things, he related the interesting fact that every one of his four children received periodic check-ups by the family pediatrician from the time the eldest was one month old until the youngest was eight years. The fee for each visit was paid with the hope that nothing serious was wrong. "And," continued the letter, "probably because the good doctor had a frequent running record of these complicated 'machines,' nothing serious ever was."

This is a sensible and wholesome attitude. It also is an attitude we can convey to the average car owner, because, in a sense, the relationship of the lubricating grease industry to automobiles and their drivers is similar to that of the pediatrician to children and their parents.

Every time a car owner pays for a lubricating job he is helping to make certain that nothing serious will go wrong. If he neglects to lubricate his car regularly he is not getting the full value of his investment. What's more, he is guilty of endangering the next driver because improper maintenance makes for unsafe automobiles.

No one knows this better than we members of the lubricating grease industry. And it would be not only a matter of good business but also of good ethics to

VISITING his second annual meeting, S. Kofune (center), president of Kyodo Yushi company in Japan, and T. Suchiya, chemist, make friends during one of the sessions.

constantly hammer home this thought to all car owners —through our advertising, our promotional literature, through our customers and other sources of contact with the general public.

And, whatever you do, give the widest possible circulation to a peerless motto that says it all in a nutshell: "Lubricate for Safety Every 1000 Miles."

Meanwhile, our friends on the Lubrication Committee of the American Petroleum Institute, alarmed at the decline in the motor oil-gasoline ratio, have proposed a listing entitled "Twenty Ways to Improve the Motor Oil-Gasoline Ratio."

Let us see what some of those twenty ways are:

1. Refer, in as much company media advertising as possible, to 1000-mile oil drains and "Lubricate for Safety Every 1000 Miles."
2. Educate company employees, whose word carries considerable weight with their friends, about the need for regular servicing of cars.
3. Carry the slogan "Lubricate for Safety Every 1000 Miles" on every lubricant package.
4. Carry the same message on letterheads and invoices, or on envelope stuffers.
5. Get the slogan on every piece of give-away or direct mail literature.

I am sure the ingenious reader will spot many of the ways which he can lift bodily, and others which, with slight variations, can also be used to increase the frequency of chassis lubrication.

So why wait? Use the 20 ways, or as many of them as possible, starting right now.

Forget, for once, trying to increase the size of your slice of the pie, and try to increase the size of the pie itself.

Public Relations

No Institute can thrive without good public relations. We think we have good public relations, but far

from taking them for granted, we constantly work at the job of making them better.

Yet, how much of our activity is the public aware of?

Certainly we owe it to the nation as a whole, as well as to ourselves to disseminate as much as we possibly can of the story of the lubricating grease industry and the role it plays in our country's progress. This is not to say that we have been keeping entirely quiet. The point is:

Have we been telling our story to the public or have we just been talking among ourselves? Just how good are our public relations?

Perhaps we should take time to draw up a sort of public relations checklist. Frank answers to frank questions should help clarify in our minds what has to be done and how it should be done. Let us ask ourselves:

Are we telling our story?

Are we telling it properly, or are we being too technical? Does our message get across?

How much does the public understand about lubricating grease? For what part of this understanding, if any, can we claim credit?

Are we creating the right climate for a bigger lubricating grease market in the future? Are we making the public aware of the need and the importance of lubricating grease?

And last, but of utmost importance—

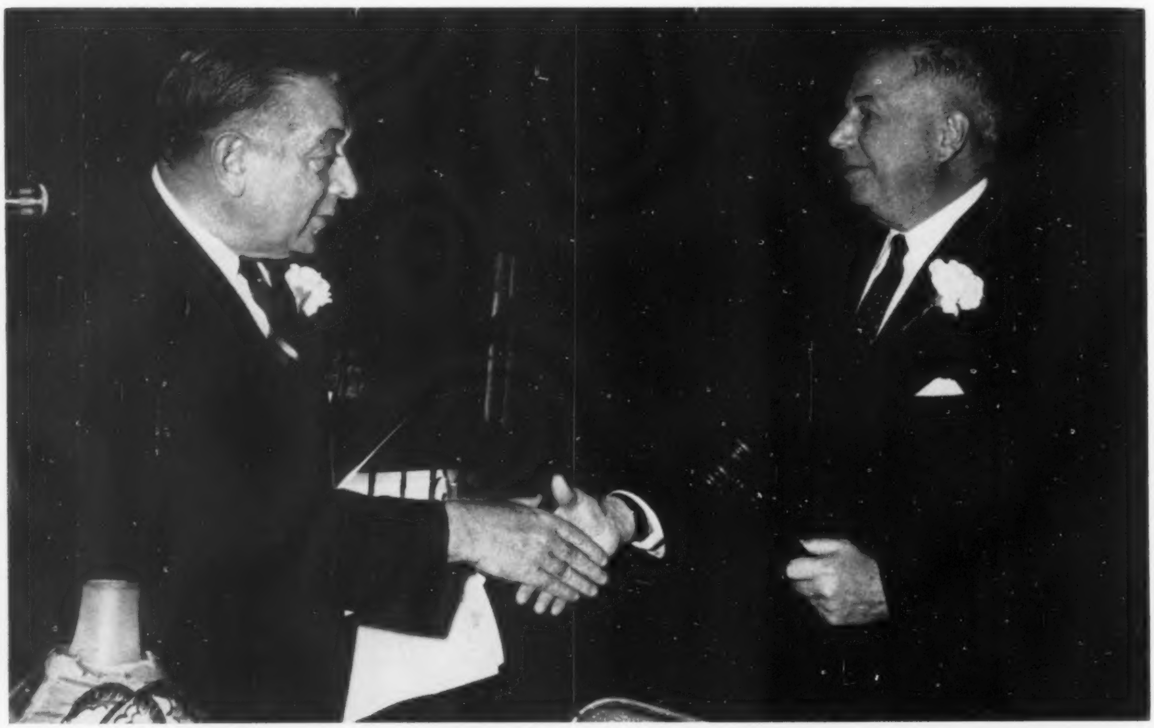
Are we succeeding in attracting the best engineers to our industry? Are we laying the proper groundwork for a continuation of the kind of progress of which we are so proud?

These and other questions can be answered satisfactorily only if we set our sights on some realistic goals. What is needed is a program that we can all practice. And while this need not be a rigid, spelled-out undertaking, such a program should:

1. Dramatize the story of grease through better and more frequent dissemination of the facts in a form the public can understand and evaluate properly.

2. Encourage the participation of every member of the NLGI. This participation should encompass every conceivable front—talks before industry groups which could be reported in the popular press; preparation of educational material; publication of research findings; stimulation of interest in our industry among students, etc.

3. We'd like to be able to do the entire job at the NLGI. This is, of course, a practical impossibility. But if every member company does its part, our goal will



LAST official duty for Cubicciotti, who opened the annual meeting with the address accompanying these photographs, was turn the president's gavel over to his successor. Here, his term completed, he offers congratulations to F. E. Rosenstiehl, 26th chief executive of the Institute, at the traditional annual banquet of the NLGI annual meeting.

be many steps closer to realization. For only then will we be able to say we have met the problem and we—all of us together—have licked it.

4. Basically, of course, we all try to see to it that the Institute does a surpassingly good job. Then we try to tell people about that good job. We make a conscious effort to maintain good public relations.

5. Our avenues of expression are almost limitless. For instance, you and hundreds like you, are present at our annual meetings, to hear about what is being done. Our movie carries our message far and wide, as do our various booklets. Our crown jewel is the NLGI *Spokesman*, a journal without peer in the field of trade publications, one which we feel shows off the Institute to best advantage.

Liaison

"In union there is strength" is an old adage, but a true one.

Our Institute has always welcomed the help of others who are in a position to help us, and we, them.

It is in this spirit that we maintain close liaison with groups such as the American Petroleum Institute, the Society of Automotive Engineers, the American Society for Testing Materials, the American Society of Lubricating Engineers, the American Society of Mechanical Engineers, and others.

It is in this same spirit that an important part of tomorrow's program will be presented jointly with the American Gear Manufacturer's Association.

Acknowledgements

And now, as an end approaches to both my term of office and to this address, I would like to acknowledge the magnificent support which I have received during the past year.

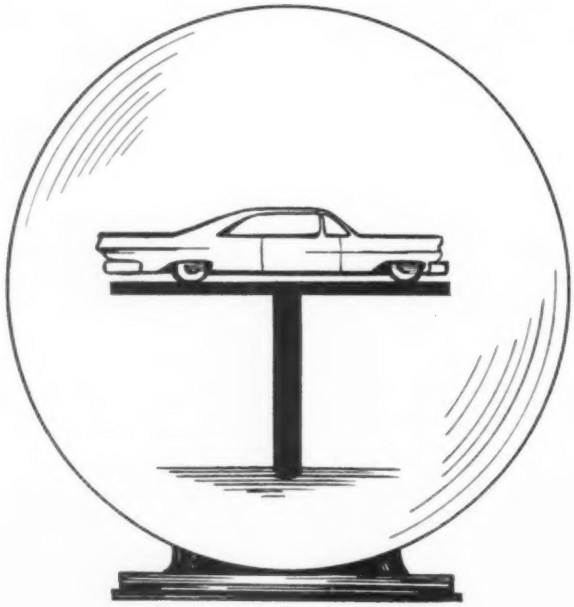
First, my thanks to my brother officers and directors. I am, or have been, a member of many trade groups and associations, but in none have I found the devotion to duty and willingness to work such as is displayed by the officers and directors of the Institute.

Next, I would like to express my appreciation to the many committees whose efforts, taken collectively, constitute the actual constructive work done by this Institute.

Then I would like to thank our General Manager and his staff, who perform the multitudinous chores assigned to them so smoothly that we sometimes suspect them of using a special lubricating grease for the purpose.

And, reserved for that important last mention, we have our members, all of them, whose fine support keeps our Institute moving forward. To you, representing our members as you do, I say "Thanks."

What's in the Future?



THE NLGI SPOKESMAN offers two exceptional marketing papers in this issue, both of which have been quoted widely throughout the industry. The first, presented at the October annual meeting of the Institute in Chicago, gives what some may feel is a pessimistic picture . . . authored by W. M. Drout, Jr., and N. L. Jenkins of Esso Standard Oil company, the paper entitled "Market Potential for Automotive Grease" was one of three talks in a panel on future grease requirements. Mr. Drout and his co-author gives marketers a hard look into the future as they see it and predict a gloomy future for lube jobs in the grease bay.

Following this work is another on the automotive market, in a more positive vein. Presented at the recent September annual meeting of the Independent Oil Compounders association in Chicago by H. A. Mayor, Jr., of Southwest Grease and Oil corporation, "Needed–New Driver Attitudes" states the case for improvement in this phase of the industry's business, but the author enthusiastically urges that education and explanation to the motorist can enlarge the future market many times over.

Related to both of these papers, the editors hope to bring in a later issue of the journal a case history of how one NLGI member has turned to the promotion of automotive lubrication in an all-out effort, and how this advertising and on-the-drive push has paid off with increased sales and customer acceptance.

Future Grease Requirements—1

Market Potential for Automotive Grease

Presented at the NLGI 26th annual meeting in Chicago, October 1958

By W. M. Droute, Jr. and N. L. Jenkins
Esso Standard Oil Co.

THE AUTOMOTIVE GREASE market is a dynamic market. It reflects both the rapidly changing technology of the automobile industry as well as the changing technology of the grease industry itself. Originally grease was (by today's standards) simply a soap thickened oil. It was designed to provide a film of lubricant between moving surfaces so as to reduce friction and wear. However, our society has always anticipated and looked for better products. This is true of grease. Many improved products which reduced friction and wear and provided many other highly desirable characteristics were developed. The search for improved products was spurred on by the expanding automobile industry. Although new products had to be developed, such as greases which could withstand the far more severe washing action of water and the erosive action of dust, the automobile industry provided a tremendous growth potential for grease products. On the other hand, it also provided an incentive to develop techniques which would minimize or eliminate the use of greased bearings.

The perfect solution to most greasing problems, particularly that of recurring greasing, would be the development of a low cost, long life, frictionless bearing, which could be sealed against the intrusion of foreign bodies. In many ways the successful attainment of this solution would seem impossible. However, the competitive aspects of the automobile business has compelled each automobile company to search for ways of providing a more desirable product. Their never ending search for technological advances has been reasonably successful. As far as grease is concerned, it is reflected in the 56 percent reduction in number of chassis fittings in the past seven years. In turn, this partial success spurs further study. Each automobile company hopes that it can gain a competitive advantage by being first to develop the car which does not have to be greased.

It is quite difficult to estimate when, or if, a technological breakthrough permitting the elimination of greased fittings will occur, and whether it will occur in one step or a series of steps. The experts, namely the automobile manufacturers, feel rather strongly that complete elimination of fittings is only a matter of time. The more optimistic feel that this will occur within three years. The more conservative feel that this will take place within five years.

The rather complete agreement that chassis fittings will eventually be eliminated results in a somewhat gloomy outlook for the growth potential for automotive greases. A realistic forecast, however, requires that all forces affecting demand be identified, that quantitative relationships to demand be established, and that future changes in these forces and the timing of the changes be determined. The quantitative development of these factors are presented in the following sections. However, even doubling the conservatively estimated time required to eliminate chassis fittings (from 5 to 10 years) still results in a negative growth rate for automotive grease consumption.

General Method

A forecast given in pounds per year is generally more useful to most groups than one giving growth rates. This, however, requires that precise industry automotive consumption figures be known for at least one year and preferably for several years. Unfortunately, there are no reliable and universally accepted data on grease consumed entirely in the automotive field. (It is hoped that future surveys will provide such data.) A reasonable approach to absolute levels can be made by using data from various surveys such as National Petroleum News, Check Chart, and private surveys including those made by Esso, which show the quantity of grease consumed per lubrication and the greasing interval, and other information. Each of the major factors affecting grease consumption has been analyzed on this basis, and the results and the summation of the results reviewed under the appropriate major headings are summarized in the table at the end of the report.

Number of Grease Fittings

As previously indicated, the most dramatically changing factor in the automotive grease market is the change in number of grease fittings on passenger cars.

As shown in Figure 1, the average number of fittings on new cars has decreased steadily from 1950 through

1956. In the 1957 and 1958 model cars, the number declined rather abruptly, but 1959 will apparently see a temporary leveling in the decline. It is currently estimated by some of the more optimistic automobile people that grease fittings will have disappeared from passenger cars by 1961. The more conservative indicate that this will occur by 1963. Recent advances in the field of permanently lubricated or essentially friction-free bearings make this development seem possible, and, as indicated earlier, all automobile manufacturers are working to this end.

The cost of developing and utilizing these newer friction-free or permanently lubricated bearings might be higher than anticipated. This could delay or even indefinitely postpone their use. The development of a new grease with improved properties, such as a longer interval between required greasing, might be an effective counter measure. It must be remembered, however, that there are sales advantages to the first automobile manufacturer who can claim that he has a car which does not have to be greased.

The effect of the probable decrease in fittings on grease consumption is not as immediate as it seems, since the net effect if a function of cars on the road,

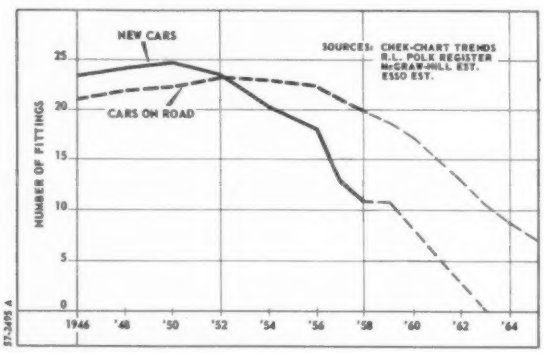


FIGURE 1, number of fittings

not new cars. In translating these data to cars on the road, we see the curve shift considerably to the right. This translation to cars on the road was accomplished by computing the actual age distribution of the total car population year-by-year for both past and future years. However, the drop will be appreciable, decreasing from an average of 21 fittings in 1957 to about 7.0 in 1965. This factor alone would tend to decrease the passenger car consumption by about 67 percent.

Even doubling the time (from 5 to 10 years) required to solve the technological problems for removal of fittings would still result in 4.8 fittings by 1965. This, however, would only increase the average number of fittings for all cars in 1965 to ten and would still decrease passenger car grease consumption by 52 percent instead of 67 percent.

Quantity of Grease Per Lubrication

From studies conducted in 1954, it was estimated that the average consumption of grease per passenger car lubrication was .51 pounds, including the effect of a wheel bearing greasing at approximately 10,000 miles.

	Passenger Cars	*Trucks*	*Buses*
Esso Estimate	.51 pounds	1.04	1.10
NPN Estimate	.52		

This was almost exactly the same as the information developed by McGraw-Hill in a separate study of grease consumed in cars. For trucks and buses less information was available, however, the best estimates possible show consumption to be slightly over one pound per vehicle per lubrication.

Annual Miles Driven per Vehicle

The next factor which, when divided by the grease interval, affects grease consumption is the total annual miles driven for passenger cars, trucks and buses. Shown in Figure 2 is the trend for passenger cars—an increase since 1946, but essentially a constant level predicted from 1956 through 1965.

Esso's own estimate follows these year-to-year

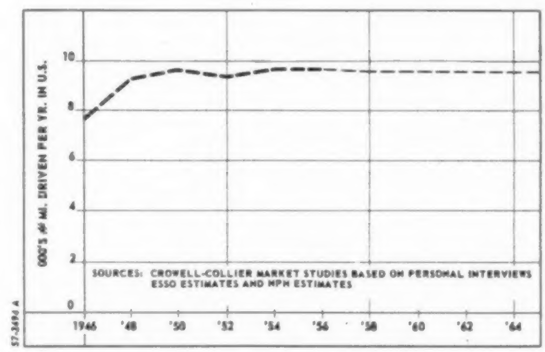


FIGURE 2, passenger cars—miles driven per year

trends developed by the other groups very closely. However, these data could be optimistic over the next few years since the growth of two car families has been appreciable and, in this case, the total family mileage (although increased) tends to be divided between the two vehicles.

The annual miles for trucks and buses were reviewed in a similar manner. In 1956, the average miles driven for all trucks amounted to 10,800 miles annually and for buses 18,000 miles annually.

Grease Interval

The next varible to be considered was the greasing interval. A careful study of the available material revealed interesting facts: First, while manufacturer's recommendations on passenger car chassis lubrication have remained relatively constant at about 1,000 miles,

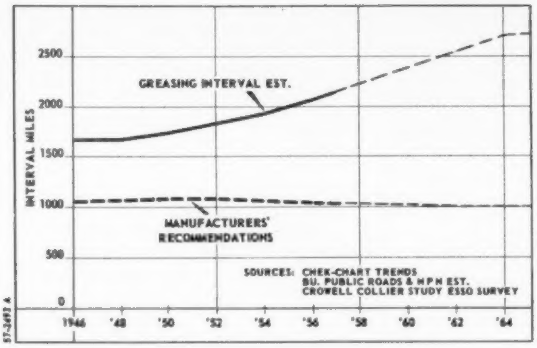


FIGURE 3, greasing interval—chassis

the evidence points to an interval much higher than 1,000 miles. Several studies point out that the majority (from 70-90 percent) of motorists generally grease their cars at the same time as they change oil. In effect, motorists compromise between the recommended grease interval of about 1,000 miles and an oil drain interval of about 2,500 miles recommended by some of the automobile manufacturers.

The estimated grease interval shown in Figure 3, then, is the same as the oil change interval and can be seen to be increasing steadily since the immediate post-war period.

Based on past performance, this increasing grease interval may be expected to continue upward to about 2,700 miles in 1965. The net effect of this passenger car market for greases is to decrease that market by about 30 percent in the next ten years.

For trucks and buses, indications are that the 1,000 mile interval is much more respected and projections were made on that basis. The convenience factor, so important in the passenger car market, is not present here.

Total Vehicles

The last variable affecting total consumption of grease is that of motor vehicle registrations.

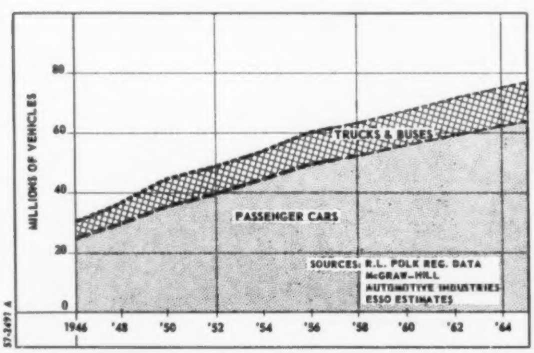


FIGURE 4, motor vehicle registrations

As seen in Figure 4, the total number of passenger cars, trucks an buses has increased steadily since 1946 and is expected to continue in the future at a somewhat slower rate. The effect of this factor will be to increase the market by about 30 percent through 1965.

Computation of the Total Market

The information on the preceding pages indicated that two of the four variables, namely number of fittings and grease interval, will operate to decrease the grease market in the future. The annual mileage is predicted to remain constant and only passenger car and truck registrations are predicted to influence the future grease market in a positive direction .

Based on these variables, the total annual grease requirements for chassis lubrication of cars, trucks and buses on the road have been computed. To this has been added the estimated consumption of bearing grease and the factory fill grease on new cars, trucks and buses. The total consumption of automotive greases, as computed on this basis, is shown in the cumulative plot in Figure 5. The top dotted line represents growth which could have been achieved provided the indicated technological changes had not occurred.

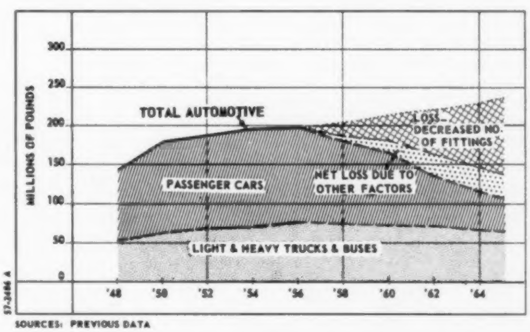


FIGURE 5, automotive grease consumption—U. S.

The lowest area on the chart shows that total amount of grease consumed by trucks and buses. This market increased steadily to 1957-58 and then decreases slowly through 1965 due to the effect of a decreasing number of fittings on light trucks which have passenger car chassis. Developments in heavy trucks and buses similar to those in passenger cars were not anticipated mainly due to the fact that, convenience is not as important a factor in selling trucks and buses. Thus, the truck market is not expected to decrease much more than 20 percent through 1965, this decrease coming mostly from light trucks.

The area immediately above trucks and buses, however, shows a much more dramatic decrease for passenger cars. From 1946 through 1956, the grease

CONSUMPTION OF AUTOMOTIVE GREASES

Millions of Pounds

	1948	1950	1952	1954	1956	1958	1960	1962	1965
Passenger Cars									
Refill	81.8	102.9	108.9	117.2	114.9	101.9	87.5	61.8	35.6
Factory Fill	4.3	7.4	4.7	5.6	5.3	4.7	4.0	3.8	4.2
Sub Total	86.1	110.3	113.6	122.8	120.2	106.6	91.5	65.6	39.8
Trucks									
Refill	50.3	61.9	67.2	68.5	71.8	71.2	68.8	66.3	61.6
Factory Fill	1.3	1.3	1.0	1.0	1.1	1.0	0.9	0.8	0.6
Sub Total	51.6	63.2	68.2	69.5	72.9	72.2	69.7	67.1	62.2
Buses									
Refill	5.0	4.4	4.7	3.9	4.1	3.9	3.7	3.4	3.0
Factory Fill	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sub Total	5.1	4.5	4.8	4.0	4.2	4.0	3.8	3.5	3.1
Grand Total	142.8	178.0	186.6	196.3	197.3	182.8	166.3	137.7	107.2

consumption of passenger cars increased quite rapidly and steadily. In the future, however, the market is expected to decrease from about 120 million lbs./yr. to approximately 39 million pounds in 1965—a decrease of 67 percent in the automotive grease market due to the factors described previously.

The effect of the decreasing number of fittings is only now beginning to be felt. This will increase as more and more cars come on the road with a smaller number of fittings, and as the older cars with more fittings are being scrapped. The crosshatch area at the top right shows the effect the decreasing number of fittings will have on the market after 1956.

The net effect of all other factors affecting grease consumption is shown in the top dotted area. This effect is minor in nature by comparison with the effect of grease fittings, but it is still substantial.

In summary, even the continued growth in automobile, truck and bus registrations does not compensate for the decline in chassis fittings and the lengthening grease interval. An improved grease to head off the inroads of the reduced number of chassis fittings or development of new markets (such as the agricultural equipment and construction equipment) seem like the only reasonable way of obtaining a positive growth rate.

W. M. Drout, Jr., *following his graduation from Bucknell university in 1952 with a BS degree in chemistry, joined the Esso Standard Oil Co. He served two years with the Navy as an electronics warfare officer. Experience with Esso includes five years of technical and supervisory responsibilities in a petrochemical plant operation, and six years of technical and administrative responsibility in petroleum and petroleum specialty economics. He is currently head of marketing economics which includes the directing of market potential studies. Mr. Drout holds six U. S. patents, is a member of several scientific and honorary societies and is active in community affairs.*

About the Authors

N. L. Jenkins *was graduated from Yale university, class of 1951 and from Harvard graduate school of business administration in 1956. The interim period was served in the Navy as engineering officer aboard a destroyer, Atlantic and Mediterranean fleets. Coming to Esso Standard Oil company immediately following his graduation from Harvard, Mr. Jenkins was assigned to the economic and marketing research division. Much of his work has been in the development and analysis of market potentials.*

NEEDED - New Driver Attitudes

By H. A. Mayor, Jr.
Southwest Grease & Oil Co., Inc.

Presented at the IOCA 11th annual meeting in Chicago, September, 1958

FOR THE GENERAL theme of this presentation, I'm indebted to our present hard-working, clear-thinking President of the National Lubricating Grease Institute, a friend and respected associate of many of you—Rudolph Cubicciotti. It was just shortly after he had asked me to serve as Chairman of the newly created NLGI Chassis Lube Committee, that he wrote a President's Page editorial entitled, "NEEDED —New Driver Attitudes."

There wasn't much work done on the Chassis Lube Committee assignment until I was strongly convinced that the two above mentioned actions, the formation of the committee and the editorial, were hatched from the same nest of thoughts. After studying both, it became quite evident to me that there's nothing seriously wrong with the Chassis Lube market, there's nothing seriously wrong with the motor oil market, there's nothing seriously wrong with any of the basic lubricant markets with which all of us are working, that a change in driver attitudes, as they relate to lubrication, won't improve. If, working together, during this 11th Annual IOCA Meeting, we can find or develop ways and the methods and ideas to effectively change or sway the misconceived and erroneous attitudes we'll discuss later, our work will have been worthwhile. Our confidence in a growing and prosperous petroleum marketing industry will be justified. How, then, can we change these attitudes?

First, let's try to define our target. And that's what we, in our company, tried to do when, about nine months ago during our annual, first of the year, sales meeting, we asked each of our salesmen to help us pinpoint the chassis lubricant problem by asking one total stranger a day—someone not knowingly associated with petroleum marketing—the following questions:

1. When do you have your car lubricated?
2. Why do you have your car lubricated?

This, of course, did not result in a comprehensive, foolproof, non-debatable survey, but it did track closely with the other work of this type done by others in our industry. The resulting approximately 1,000 interviews in 34 states can be briefly summarized.

In answer to the first question, it was learned that:

A. Only 28 per cent of the people lubricated their cars every 1,000 miles, according to our present industry recommendation.

B. Only 48 per cent of the people lubricated their cars on or before 2,500 miles.

C. 52 per cent of all people interviewed exceeded a 2,500 mile interval policy.

This latter category includes those people who stated they never lubricated their cars because they did not think it was worthwhile or required.

In answer to the second question asked during our interviews, we found that motorists have many varying reasons why they should or should not lubricate their cars, many valid but some vague and misconceived. Here is a summary of our answers to the question, "Why?":

A. Preventive Maintenance	51%
B. Better Driving	21%
C. Factory Recommendation	13%
D. Unexplained Necessity	15%

These answers must, of course, be interpreted in the light of the answers to Question No. 1. Such are the attitudes we must try to correct. The Good Lord knows there are other driving attitudes which need correcting, too, but let's leave those to the National Safety Council, the Highway Patrol, our local police, and us parents.

How, then, can we do this job of changing driver attitudes? Here are my ideas.

I. Let's unite more solidly than ever behind a 1,000 mile interval recommendation. It's admitted that our industry is badly in need of additional scientific proof to back up this recommendation. At the same time there are many of our highly qualified technicians who

strongly believe such proof can be developed, so let's give them the opportunity to do it. Let's individually and collectively, through our companies and trade associations, work toward such tests and procedures that will substantiate beyond a doubt the need for this 1,000 mile lube job. Let's not wait, however, for such developments to tell the world about the advantages as we now know them, of a regular 1,000 mile chassis lubrication interval. Let's stand firm and united on the 1,000 mile recommendation.

II. Let's inform the public about and sell to them, the multiple benefits of a regular 1,000 mile grease job, especially those benefits that we know are impressive and salable—SAFETY, SAVINGS and COMFORT.

SAFETY: We can place much emphasis upon the safety aspects of a regular grease job, for here our statistics are strong. Accurate, voluntary surveys by the Motor Vehicle Safety Check Program have shown that over 20 per cent of all registered automobiles now on the road are dangerously and improperly maintained. These are the vehicles which are contributing heavily to the annual saddening traffic fatality total, 38,500 for 1957, not to mention the 1,400,000 persons injured nor the $5,300,000,000 dollars of personal property damage.

No one can deny that there is not a more practical, effective place in the world today for an efficient automobile safety check than on the grease rack. All of us are familiar with actual instances of life and property saving actions taken by lubrication people as they inspect and correct loose or damaged steering apparatus, weak or leaking brake fluid lines, dangerously damaged tires and wheels, and leaking exhaust systems.

SAVINGS: Nobody can argue with the age-old axiom "an ounce of prevention is worth a pound of cure." Let's steal the pages from the manuals of our life insurance selling friends and our doctors, and sell the motoring public a preventive maintenance program like so many of us practice so loyally in our physical fitness programs for our family.

In many cases, the family rolling stock represents the family's largest capital assets—and properly maintained, their car will retain proper values. This ultimately means more money in the pocket. To handle a real need, let's as an industry, launch a strong, well financed technical effort to measure the dollar and cents value of the 1,000 mile chassis job, compared to the longer intervals previously mentioned—something similar to the good work that is available in this field as it relates to motor oils. Some way, somehow, because we know they are there, it should be possible to measure the actual savings resulting from a regular 1,000 mile chassis lubrication program.

COMFORT: Here, again, we're short on properly interpreted technical proof, but all of us know that the most comfortable auto ride of all is that one which immediately follows the grease job. Our friends and experts in Detroit tell us that they strongly feel that the automobile ride begins to deteriorate within 50 miles after a lube job. This, of course, points to a product performance problem with which all of us in the grease industry are wrestling—but of most importance, this is proof that the chassis lube job promotes automotive comfort. If we talk about it, and tell our customers about it, they will notice it. And they'll buy it more often.

Let's remember that never has the American public been so willing, so capable, and so anxious to buy comfort. It's a by-product of our rapidly increasing standard of living. It's a trend that will continue. Leisure time and comfort will continue to be a bigger factor in the lives of all of us than ever before.

While exploring the ways and means to tell the public about these multiple benefits, and so sell them to the motoring public, here are some of the ideas that were developed. (Presentation of 35mm Kodachrome slides showing promotional art work.)

These suggested themes could be effectively used by our industry as

Service Station Placards
Envelope Stuffers
Invoice Stickers
Car Bumper & Car Window Stickers
Road Map Inserts
Institutional and Product Advertising Inserts
Can Lithography Inserts
Radio and Television Copy.

Perhaps the IOCA, in cooperation with the NLGI and the API, could make such artwork available in some of the above suggested forms at nominal or subsidized costs. With as big a stake as our company has in this picture, we would seriously consider an annual financial commitment to apply against the subsidization, through an industry group such as the IOCA or NLGI, of such a program. Surely, our competitors and other related suppliers would do likewise. Properly disseminated, such messages could not help but create better driver attitudes as they relate to lubrication.

Further along this line, perhaps our industry should consider a new industry slogan, something that could be universally used in all industry promotions, written or spoken, branded or unbranded, and something which would have more general appeal than our present slogan, "LUBRICATE FOR SAFETY EVERY 1,000 MILES."

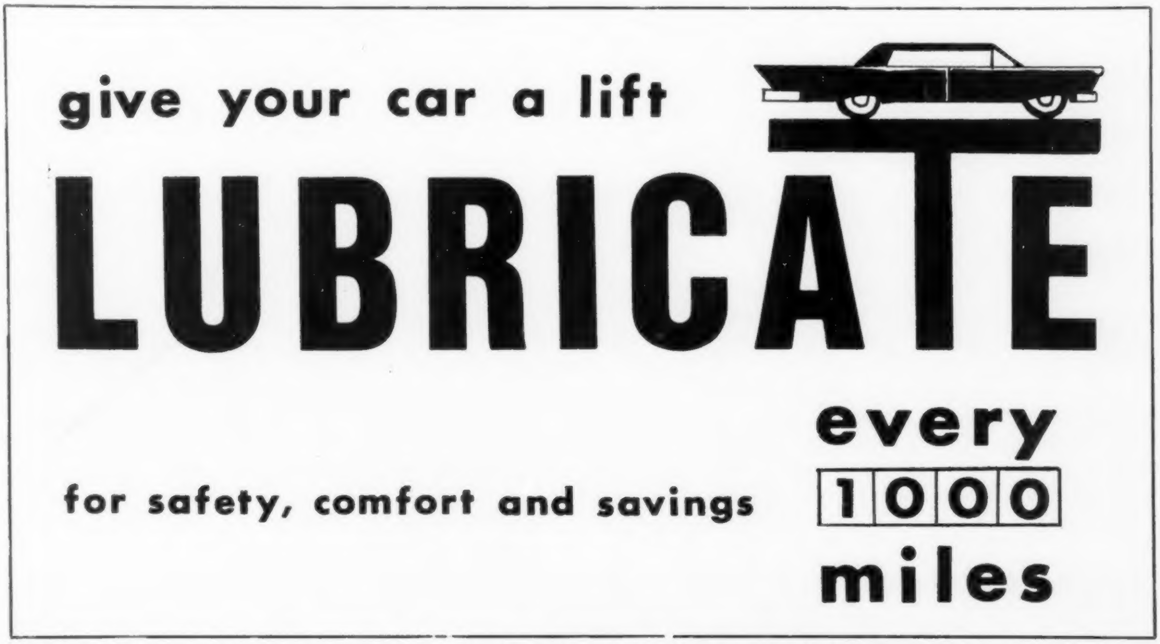
As previously discussed, we have safety to sell, and more too! Perhaps safety is the least salable of all the benefits we have to sell, for, historically, the

American people are going to live dangerously. Perhaps we could more easily convince them, through the benefits of regular lube jobs, to live economically and comfortably than we could convince them to live safely.

Naturally, there would be much well directed, sentimental, honest opposition to this proposed slogan change, and personally, I would agree that perhaps this is not the time to consider it. Perhaps we should instead strive for more universal effective use of our present slogan. We all know that in this endeavor, there's plenty of room for improvement. After the hoped for progress with our present slogan, maybe we could then up-grade or improve it as mentioned before.

During my deliberations of these possibilities, however, I couldn't help but think of a rebuttal that I often use in my controversies with my father, the President of our company, a man whom many of you know intimately. It's with complete respect and with all humility that I sometimes remind him that if we all had forever followed in the steps of our forefathers, we'd still be living in caves and eating raw fish. For me, this type of somewhat radical thinking sometimes counteracts the normal resistance to change that is so often encountered. Let's not forget that change, more often than not, represents progress, so some day perhaps we should seriously consider such a change in our industry slogan.

III. Let's improve upon our grease job solicitation efforts at all levels. How often have you been asked, by a grease job marketer, for the authority to lubricate your car? Maybe this can be accomplished by utilizing some of the following suggestions.



DOZENS of themes and ideas were worked up by the author, such as this phrase which enlarges upon a familiar slogan.

a. Time changes everything and especially the attitudes and ambitions of our employees. We should never relent in our efforts to keep them fully informed about the sales potential and the resulting profit potential of the chassis lubricating job.

Grease jobs can be profitable, and as selfish as it may appear to our Socialistic and Communistic counterparts, our sole motive for operating any business today is profit. Let's then look at the profit potential that is inherent in our 1,000 mile interval objective. Today, there are 66,400,000 registered vehicles in the United States, not counting Alaska, which are driven an average of 10,000 miles annually. Computed on an average interval of lubrication basis of 2,500 miles at $1.50 per job, this represents $398,400,000 of income for grease job marketers. It's easy to see that on a 1,000 mile basis, this income increases 250 per cent or to $1,046,000,000. This should be reason enough for our employees, agents, and associates to cooperate with an industry-wide program as outlined.

b. If we could find some way to mechanize or automatize the solicitation, the motoring public could not so often escape the question. How about an industry effort to put this guy—(Present near life-size portrayal of service station attendant asking the question, "Please, Sir, may we grease 'er?")—on every service station island and in every car dealer's service sales area?

Let's not forget that the American Revolution was started by a handful of men and out of it grew our present form of constitutional government, and the free enterprise system of which we are so proud. The actions of this small group, the IOCA and its friends, can change driver attitudes. We have a justified cause and I think we can muster the manpower. We have some hard-hitting ammunition and we can develop more.

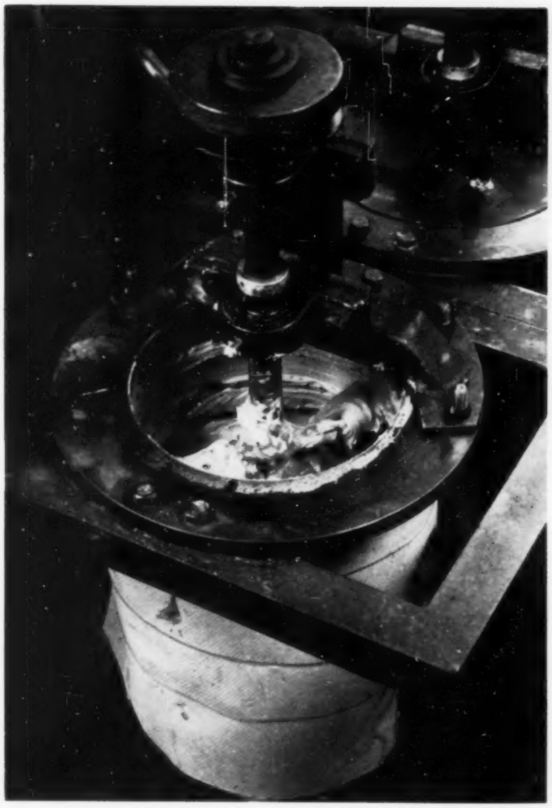
In conclusion, I'm reminded of a parable that was presented to one of our ambitious territory representatives not long ago by one of the big grease buyers who is active in this very group. It temporarily deflated his sails, but he came out of the experience with a lesson he'll not soon forget. And when hearing of it, all of us in the office perked up our ears and opened our eyes too. I think it cleverly touches upon the problems just discussed.

FROM THE BUYER TO THE PEDDLER
"They tell me you've spent a big wad of dough
To tell me the things you think I should know.
How your plant is so big, so fine, so strong,
How your founder had troubles for, Oh, so long.
So he started the business in old '32.
How tremendously interesting that is to you.
But tell me quick and tell me true,
Tell me what your products will do.
Less of how these products came to be,
More of what the damned things will do for me.
Or else, my boy, the Hell with You!

Let's tell the motorist what our lubricants and service will do for him and we'll change his attitudes.

About the Author

H. A. Mayor, Jr. *is executive vice president of Southwest Grease and Oil Company, Inc. After completing military service in World War II, Mayor joined Southwest as plant coordinator. He was elected to his present office in 1952. He is a graduate of the Oklahoma Military academy. Mayor is chairman of the Packaging Institute and a member of SAE and API lubrication committee. He was elected to the NLGI Board of Directors in 1953. In addition he has served on the API-NLGI Joint Container committee, the NLGI Program and Publicity committees and was the NLGI liaison representative to the American Standards Association. Mayor was recently elected at the 26th annual meeting of the National Lubricating Grease Institute to serve as the Institute's 27th vice president and the Chairman of the 1959 program committee.*



LABORATORY batches of extreme pressure greases were made in this kettle with conventional grease mixing paddles rotating at 100 rpm. assisted by breaker arms positioned in close proximity.

By Dr. R. K. Smith
E. F. Houghton and Co.

Presented at the NLGI 26th annual meeting in Chicago, October, 1958

Development of Extreme Pressure Greases

THE NEED FOR extreme pressure greases, capable of operating over extreme temperature ranges, has been intensified by the recent developments in aircraft technology. As the speeds of aircraft increase, the thermal effect becomes greater and portions of the aircraft, formerly not exposed to extremely high temperatures, become heated excessively as a direct result of the high speeds of the aircraft. A number of components of the aircraft operating at these speeds are under extreme load conditions. For example, the spherical bearings on which ailerons, stabilizers, and rudders are suspended carry loads as high as 50 to 100 thousand pounds per square inch. The actuators which are used to control these surfaces are also very heavily loaded. Since the entire air frame is subject to the entire range of temperatures, the greases which are designed for lubrication of these components must be capable of meeting the same requirements. These components, in general, are not subjected to high speed rotary motion, but the bearings are usually subject to oscillating motion. Other parts of the air frame, which can utilize the same type of grease, are those components of the control apparatus which are not hydraulic in character. Again, we are dealing with low speed, highly loaded bearings which may be spherical or anti-friction in character and which, again, are subject to oscillating movements. Because of the lack of a grease designed to lubricate these components, the Air Force, Materials Laboratory, WADC, initiated the current project for the development of an extreme pressure grease for these particular applications.

Greases, based on conventional petroleum stocks, which are capable of sustaining extreme loads have been used for many years at conventional temperatures. As the temperature requirements for operating conditions of greases have increased from a relatively modest range to temperatures as low as 65° below 0°F and several hundred degrees above 0°F, the use of petroleum base stocks becomes one of the inherent limitations of lubricating greases. New base stocks must be used for these extreme conditions. Moreover, many gelling agents which are satisfactory up to 250°F or 300°F are not suitable for maintainance of a grease structure at temperatures in higher ranges. Another difficulty is the selection of extreme pressure agents which are stable and effective throughout the whole temperature range. Suitability of additives for synthetic base stocks presents another problem.

A group of parameters were chosen to define the target grease. It was desirable to have a dropping point greater than 450°F, and concurrently an evaporation loss at 400° of less than 5 per cent. Because of the nature of the application, the grease was expected to be in the NLGI No. 1 grade with a maximum loss of 100 points in penetration after working 100,000 strokes. Also, the finished grease should be resistant to water washout and should have no corrosive properties toward metal parts which might be used in the air frame construction. With regard to the requirements for load-carrying characteristics, the target of a 50 Mean Hertz load was established. (The Mean Hertz load measured by the Shell 4-ball extreme pressure machine provides an index of load-carrying ability which combines the maximum load which can be imposed directly upon the lubricant as well as the wear scar diameters, which are observed during the course of the test). Greases qualified under specification MIL-G-7118 must have a Mean Hertz load of 30. The belief was that this Mean Hertz load value was not sufficiently great to predicate adequate lubrication of the spherical bearings under discussion.

At the onset of the work, a number of rather arbitrary decisions had to be made in order to limit the experimental work to a reasonable quantity.

The first of these decisions concerned the fluids which would be evaluated as base stocks for the finished grease. After a rather extensive survey of the literature, and consultation with various suppliers, the decision was made to limit our study of base fluids to those shown in Table I. The decision to select these particular fluids was based upon availability, as well as known characteristics of these materials. It will be observed that the fluids represent three silicones and two esters. Two of the silicones contain chlorinated aromatic groups which resulted in materials with better wear characteristics than were true of the third silicone, which was a phenyl methyl polysiloxane. Two esters were selected which were based on neo-pentyl type alcohols since these esters were known to have better stability at high temperatures than esters which have hydrogen on the beta carbon. While the silicones possessed the desired viscosity temperature characteristics which would make them suitable over the entire temperature range, the theory was that addition of esters would be necessary in order to obtain suitable wear characteristics of the finished grease. During the course of the work, phase diagrams for different mixtures of silicones and esters were obtained. A typical diagram is shown in Figure I for the neo pentyl ester and chlorinated silicone B. It will be observed that a 50-50 mixture, by volume, of these two materials shows separation at temperatures below 90°C. On the other hand, 25 per cent of the ester is completely soluble in a chlorinated silicone at temperatures as low as 0°C.

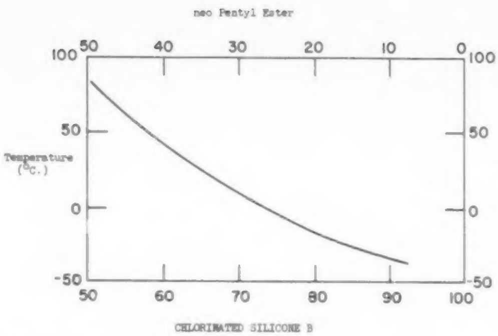


FIGURE 1, solubility characteristics

TABLE I
PROPERTIES OF SYNTHETIC FLUIDS

	Phenyl Methyl silicone	*Chlorinated A*	*Silicone B*	*Pentaerythritol ester*	*Neo-pentyl ester*
Viscosity cs @400°F (E)	4.0	2.6	6.5	1.4	1.5
−65°F	900	7,000	1,800	45,000	50,000
Evap. loss 22 hrs @400°F	1.5	25	3	2.2	14.6
Mean Hertz Load	12	15	15	10	10

(E) Extrapolated

While this information was of general interest, it was later found that complete solubility of two base stocks in each other was not a necessary requirement for the production of a stable grease. In fact, greases based on mixtures of silicone and ester have been found which give an increase in the Mean Hertz Load, even though the fluids are not in solution in each other. This may not be surprising, if it is remembered that greases inherently are two phase systems. The addition of a third phase may serve as a simple means of effecting a desirable blend of the individual properties of each phase. At this point, however, no attempt has been made to determine the relationships among the three phases which may be involved in a particular grease.

Another arbitrary decision was made with regard to the thickener, which was to be used in the target grease. Extensive work*, under Air Force sponsorship, has been done on potential thickeners for greases in the desired operating range. The most advantageous thickener, which they had evaluated at the time this work was started, was an aryl substituted urea. This material was made in the base fluid by reaction of mixed aromatic amines with a diisocyanate. The technique of producing a stable grease from these materials has been amply described in the literature, and will not be discussed. It is recognized that other thickeners might have been used, but for the sake of expediency the majority of our work utilized this type of thickener in concentrations of approximately 20 per cent. It was found that the concentration requirement would vary with the type of base fluid, which is used in the grease. However, these variations were not particularly significant.

The anticipation of the extreme pressure requirements was approached from two independent directions. One of these was based upon the work in other laboratories in the development of silicone lubricants. It had been found that incorporation of metallo-organic materials in silicones resulted in a final product which exhibited more desirable wear characteristics than did the original fluid. For this reason, a number of treatments of silicone fluids were initiated in order to incorporate various metals into the siloxane molecule. A very brief summary of the results is shown in Table II.

It will be observed, that the only treatments which increase the extreme pressure characteristics, of the basic silicone fluids, were those involving phosphorous, chlorine and sulfur. The addition of heavy metals, such as lead or thorium, had no effect upon the weld point nor upon the scar diameter as measured by the Shell 4-Ball E. P. Machine.

The other approach, which was initiated, concerned the investigation of commercially available extreme pressure agents. A search of the literature had failed to reveal any data concerning the use of these materials in either silicones or esters. Approximately a score of commercially available extreme pressure additives were evaluated in both esters and silicones. While a number of these additives showed promise in one of the base fluids, the overall characteristics of available additives were not highly desirable. Table III shows a summary of typical materials which were evaluated in the selected base fluids. The test ratings which are shown were obtained on the Falex machine, and the ratings given are related to the neopentyl ester with no additive. The first additive shown, which improves both types of fluid to approximately the same degree, was a straight chlorinated paraffinic material of conventional manufacture. The second additive shown met the requirements for VV-L-761 gear lubricant additive. This was a very active material which was subject to extreme corrosion characteristics at high temperatures. The phosphorous sulfur-chlorine additive shown in Table III is typical of the Mil-0-2105 additives and showed considerable improvement in the load-carrying capacity of both esters and silicones. The fourth additive shown was a phosphorous ester, which showed some moderate improvement in load-carrying capacity of the ester, but which is, in general, inactive in the silicone. Phosphorous esters, of course, have long been used to improve wear characteristics of dibasic acid esters, but these materials have relatively little effect upon the total load-carrying of the finished lubricant.

Review of the data which had been obtained, at this point, led to the conclusion that sulfur and chlorine would be desirable if they could be incorporated into

*U. S. Patent 2,710,839-41, E. A. Swakon and C. G. Brannen, "Aryl Urea-Thickened Greases," 1955.

TABLE II

CHEMICAL TREATMENT OF CHLORINATED SILICONE

Tin Lead Thorium	no change in Shell 4-Ball E.P.
Boron Phosphorous–chlorine Phosphorous–sulfur	increase in Shell 4-Ball Weld

TABLE III

COMMERCIAL ADDITIVES

(Relative Falex Ratings)

Additive	*neo-Pentyl ester*	*Chlorinated Silicone B*
none	100	50
Cl	160	75
S-Cl	–	200
P-S-Cl	225	175
P	120	–

TABLE IV

EXTREME PRESSURE CHARACTERISTICS (MHL)

(ASU Greases)

3% Experimental Additives, Series A

Additive	*Chlorinated Silicone A*	*Chlorinated Silicone A 50% neo Pentyl ester 50%*
None	30	36
Basic acid	50	53
Zinc salt	53	58
Lead salt	54	—
Cadmium salt	—	48

an additive which did not have the disadvantages of commercially available materials. Attention was then devoted to the synthesis of sulfur and chlorine containing materials in which both the sulfur and chlorine are non-corrosive but still active with regard to lubrication of metal-to-metal surfaces at moderate temperatures. As a result of this work, a group of additives were developed which are designated as series A in Table IV. The basic material, in this series, is salt forming in character. Three per cent of this material, in both the chlorinated silicone and a blend of chlorinated silicone and neopentyl ester, gave a Mean Hertz Load of approximately 50 in the Shell 4-Ball E. P. Machine. Subsequently, the zinc, lead and cadmium salts of this material were synthesized. These materials did not show a great increase in Mean Hertz Load, but they were somewhat less corrosive to steel at high temperatures than was the original material. Of this particular series, the zinc salt has been used extensively in the preparation of greases for extreme pressure applications.

Almost concurrently, another series of sulfur-chlorine materials was developed which gave even higher Mean Hertz Loads in the same type of silicone greases. In this series it will be observed, in Table V, that the parent acid gives a Mean Hertz Load of 94 at 3 per cent concentration. This particular series has the advantage that organic esters, which are more soluble in the base fluids than were the metal salts discussed in series A,

TABLE V

EXTREME PRESSURE CHARACTERISTICS (MHL)

(ASU Grease)

3% Experimental Additive, Series B

Additive Concentration	*Chlorinated Silicone A*	*Chlorinated Silicone A 50% neo Pentyl ester 50%*
None	30	35
Basic acid	94	72
Methyl ester	53	—
Propyl ester	47	—
Hexyl ester	40	—
Chloro butyl ester	48	—

can be made. The properties of some organic esters of this acid are also shown in Table V. It will be observed that these esters are less active than is the parent acid.

It is, also, of interest to observe the effect of concentration of the additives with respect to the change in the Mean Hertz Load of the compounded grease. Table VI shows that increase in concentration of the zinc salt, of the Series A type of additive, increases the Mean Hertz Load to a much lesser degree than the original addition of 3 per cent of the additive. Also shown, in Table VI, is the effectiveness of this additive in different base stocks. At the time these data were obtained, a disiloxane grease was available. Three per cent of the zinc salt was compounded into this grease and a modest increase in Mean Hertz Load was observed. The details concerning the original manufacture of the grease are not available; it is possible that one of the original grease components acted to nullify the

TABLE VI

EXTREME PRESSURE CHARACTERISTICS (MHL) IN DIVERS FLUIDS

(ASU Greases)

Zinc salt—Series A, concentration %

Fluid	*Concentration, %*		
	0	3.0	6.0
Di-siloxane*	45	53	—
Neo Pentyl ester	20	30	—
Chlorinated silicone A	30	53	77
Chlorinated silicone A / neo Pentyl ester	35	58	62
Methyl phenyl silicone / neo pentyl ester	26	58	68

*Grease supplied by WADC: MLG-9643. Previous additive treatment unknown.

effect of the additive. It will also be noted that the grease compounded from the neopentyl ester did not respond to the same degree as did the silicone base greases. The reason for this is not understood at the present time.

Previously, we had mentioned that the target grease should not be excessively corrosive to steels which might be used in the airplane contsruction. Consequently, a number of steels have been studied in the presence of the experimental greases at 400°F. A typical result is presented in Table VII. On 4340 steel, an aryl substituted urea grease compounded from a chlorinated silicone shows no corrosion when the grease contains either the zinc salt of series A or the acid member of series B. A very light surface corrosion was observed when the zinc salt of series B was utilized. This is in marked contrast to the very extensive corrosion which was observed when the commercial sulfur-chlorine additive as utilized in VV-L-761 was added to the grease.

TABLE VII
CORROSION CHARACTERISTICS
(72 hrs. at 400° F, 4340 steel)
ASU Grease—Chlorinated Silicone A

Additive	*Corrosion Ratings* *Weight Change*	*Comments*
None	+ 0.5 mg	Surface stain
3% Zn–Series A	+ 0.5 mg	Light stain. No corrosion
3% Acid–Series B	+16.2 mg	Scattered stain. No corrosion
3% Zn–Series B	+ 9.3 mg	Scattered surface corrosion
Commercial S-Cl	—	Extensive corrosion

Data were also obtained on the stability of the additive at 400°F over a 96 hour period. These data are presented for two greases containing the zinc salt of series A in Table VIII. It will be observed that no substantial change, in the Mean Hertz Load characteristics of the greases, was attained at the end of the tests. This demonstrates that the additive is sufficiently stable to withstand the anticipated operating temperatures and still remain effective.

In summation, the work carried out in accordance with the above discussion, has led to a series of greases which meet the original parameters in varying degrees. The extreme pressure characteristics of the greases produced in this work are considerably greater than the

TABLE VIII
EFFECT OF HIGH TEMPERATURES
ON EXTREME PRESSURE CHARACTERISTICS (MHL)
ASU Greases
3% Zn salt, Series A, 400° F

Base Fluid	*Initial*	*Time, Hours* 24	48	72	96
Chlorinated Silicone A	53	63	63	67	59
Chlorinated Silicone A neo pentyl ester	58	46	46	46	61

TABLE IX
PROPERTIES OF NEO PENTYL ESTER—SILICONE
ASU Grease; 4% Series B Additive

	Target Parameters	*Observed Data*
Dropping Point, °F	450	>475
Evaporation Loss, % @400°F	5	12
Worked penetration	280-340	285
Apparent viscosity, 20 sec^{-1}	15,000 p @–65°F	14,000 @–60°F
Worked stability–100,000 strokes	375 max.	300
Navy Gear Wear Test	MIL-G-3278	3.5mg Loss @5#
Mean Hertz Load	50 min.	98
Water washout	Pass	Pass
Shell 4-Ball Wear Test		
10 kg load	—	0.53
40 kg load	—	0.77
Bearing Corrosion	2	1

original target. Table IX shows how one of these greases compares with the other parameters of the study. The particular grease described is based on a blend of esters and silicones and utilizes aryl substituted urea as a thickener. This combination gives exceptionally good work stability, and has been evaluated in the Shell Roller Tester at 400°F with very satisfactory results.

Data have been obtained on representative greases of this type in ball and screw actuators, operating at temperatures up to 400°F. Studies have been made in oscillating systems, utilizing Shafer roller bearings at 100,000 pounds per square inch at 450°F. Preliminary data from these tests have been encouraging.

Another result of this study has been the development of two series of extreme pressure additives which have shown effectiveness in silicone and esters. It is anticipated that products, based on these materials, may become available in the near future.

In conclusion, the writer wishes to thank the United States Air Force for permission to release this paper, and also for the support it has rendered to the research project.

About the Author

R. K. SMITH *received his BS degree from Pennsylvania State college in* 1940. *He received a PhD in physical chemistry in* 1944 *from Princeton university. He was associated with Standard Oil Development company from* 1943 *to* 1947. *During this period he was active in spectroscopic investigations and reactions of hydrocarbons in alkylation, isomerization and polymerization systems. In* 1947 *he joined Kendall Refining company as group leader in lubrication and chemical research. In* 1953 *he became tion as chief of the exploratory research. associated with Houdry Process corpora-* *In* 1956 *Dr. Smith became associated with E. F. Houghton* & *Co. as manager of research.*

Literature and Patent Abstracts

C. J. Boner

Editor's note:

Beginning with this issue of the journal, Mr. Charles J. Boner will serve the Institute as its supplier of patent data, abstracts, and developments within the industry. This marks the advent of expanded and more comprehensive coverage, and is considered another forward step in the progress of NLGI and its monthly magazine.

Mr. Boner, director of laboratories for Battenfeld Grease and Oil corporation, Inc. of Kansas City, has a long history of experience and accomplishment in the lubricating grease industry. A graduate of the University of Missouri, he has served with Battenfeld of Kansas City for over 30 years. For much of that time he has been active in NLGI projects, having served for several years as chairman of the Technical subcommittee on procurement of papers for the NLGI SPOKESMAN. In 1954 he published the book "Manufacture and Application of Lubricating Greases," generally considered to be the most definative work on the subject and used throughout the world. For his many contributions Mr. Boner received the Institute's Award for Achievement in 1955. A past chairman of the Kansas City section of ACS, Mr. Boner is currently vice chairman of the Kansas City ASLE chapter.

Tentative plans call for divisions of material . . . analysis . . . application . . . compositions . . . processing . . . testing, in order that the reader may have quicker access to portions of greater interest. Readers are invited to submit their suggestions and ideas to Mr. Boner via the national office.

Conference on Lubrication and Wear

The Institute of Mechanical Engineers held a conference on Lubrication and Wear in London during October 1957. Since a number of the papers given at that time concern either lubricating grease or gear compounds, abstracts of such presentations will be given in this column.

On Grease Lubrication of a Slider Bearing, A. A. MILNE

A transparent model bearing permitted observation of flow and particle velocities of either oil or lubricating grease and thus a comparison of the two lubricants. To aid in this observation a small quantity of aluminum paint was dispersed in the oil and a small quantity of bronze powder added to the grease. Movement of individual particles of the metals could then be observed through a microscope.

The aluminum flakes dispersed in oil rotated slowly during their passage through the bearing. Similar particles in lubricating grease became orientated almost parallel to the bearing surface.

The flow pattern for lubricating grease showed less side leakage than that of oil and also while the oil exhibited regions of reverse flow this was not true of grease. This agrees with practical experience in that the two main effects of the use of grease in place of oil in a bearing are the existence of unsheared regions and reduction of side leakage. While the lubricating grease used in the experiments was a buttery, calcium base product with a penetration of 305 other bearing greases would probably have a similar flow.

Observations on the Movement and Structure of Grease in Roller-Bearings, A. A. MILNE, D. SCOTT *and* MRS. H. M. SCOTT

The movement of various types of lubricating greases in a transparent model roller-bearing was observed. Visual study indicated that three distinct groups of regions exist in a grease-lubricated roller bearing.

First, a very small quantity of lubricating grease adheres to the surfaces of the rolling and sliding members.

Second, a small reservoir of grease is present as pads on the cage.

Third, the bulk of the lubricant remains outside the bearing and in the covers, when these are provided.

The lubricating grease in the first region is subjected to intense shearing action and is the actual lubricant. On the other hand, the remainder of the grease undergoes some working during the initial stages of running but then reaches a state of relative, if not complete immobility.

Samples of the lubricant were taken from selected regions and electron micrographs made. These showed that the fiber structure of the lubricant taken from the rolling surfaces was almost completely destroyed. In contrast samples taken

from the cage, where the lubricating grease is relatively immobile, has undergone little structural change.

In packing the bearing a few small air pockets were left. Otherwise churning would result. The above grease distribution and movement at speeds of 6 to 1,000 rpm were similar.

A conventional lime-base lubricating grease of 32_0 penetration was used in the first observations. Other experiments employed buttery calcium-base products of different consistencies. A lithium base lubricating grease as well as several sodium-base products were also tested. Results were similar except that in the case of the more fibrous greases the lubricant appeared to be pulled from the cage by contact with the portion of immobile lubricant outside the bearing rather than by being expelled from the ends of the rollers.

A further point of interest was that portions of the calcium base lubricating grease were subjected to either 10,000 strokes in a microworker or to four hours in a rolling stability tester, operating at 160 rpm and at room temperature. Neither of these latter treatments resulted in fiber breakdown such as occurred due to the action of bearing rollers.

The Influence of Grease Structure on Boundary Lubrication,

A. A. MILNE *and* W. L. COOKE

In the experiments described a M.E.R.L. rotary friction machine was used. In this apparatus a ring 3¼ inches in diameter is rotated about a vertical axis while three loaded rods bear on the ring.

Three lubricating greases were tested: namely a buttery, hydrous, calcium base; a lithium base; and a smooth, stringy, sodium base which was intended for ball-bearing application. The coefficients of friction were determined at two different sliding velocities, first with both friction elements as steel and next with one of these copper.

The lubricants were tested in the condition as taken from the container and after being subjected to heating. For the latter purpose a small sample was placed on a watch glass, covered with an inverted beaker, and heated in an oven for two hours at 302°F. Finally, the heated samples were permitted to cool slowly to room temperature without agitation.

After 24 hours the calcium base lubricating grease was much softer than the original product and electron micrographs indicated that the original fiber had changed to a granular form. At low sliding velocity this product with modified structure exhibited about 50 per cent higher coefficient than the unheated lubricant.

The heated lithium base lubricating grease was somewhat stiffer and the fibers of soap had grown. The friction values were lower for the

heated product than for the unheated.

Most of the fibers in the sodium base lubricating grease were unaffected by heating and there was a slight increase in the friction of this portion compared with the unheated product.

This investigation shows that friction may be significantly affected by the state of soap fibers in lubricating greases. For the products tested indications were that fiber breakdown causes a deterioration in lubricating properties and fiber growth an improvement. It was suggested that rheological behavior is important in boundary lubrication.

Study of the Effect of Lubricant on Pitting Failure of Balls, D. Scott

A modified Shell four-ball lubricant tester permitted the three lower balls to rotate in a specially designed race. A load of 600 kg. on the upper ball was used and six tests made with each lubricant and the average time to failure in minutes recorded. Employing a lithium base lubricating grease which was undisturbed during the test, failure occurred in 46 minutes. Since, under such conditions, the grease exuded and an excess accumulated at the outside edge of the lubricant bath, further tests were made in which the lubricant was periodically fed back into the region of rolling contact. This prolonged the life of the balls to 93 minutes. Of eleven lubricating fluids tested, including both mineral oils and synthetics, only one had a life longer than the latter test with grease.

Fretting Corrosion of Cast Iron, K. H. R. Wright

Lubricating greases and oils, with and without additives, were used in this investigation. A calcium soap base product, having a worked penetration of 280 to 295 and containing an oil of low V.I. and viscosity of 275 Redwood No. 1 at 140°F., was tested without additives and after the addition of lead soap or sulfurized material or of free fatty acids. Also lithium and lithium-sodium base lubricating greases were used.

When cast iron surfaces were lubricated with either oil or grease the amount of fretting wear varied with the hardness of the iron. It was found that oils were slightly superior to lubricating greases but the level of difference was only 25 per cent. The presence of E. P. additives in lubricating greases was found to be of little value under the conditions used in the investigation.

Studies of Scuffing with a Crossed-Cylinder Machine, A. A. Milne, D. Scott *and* D. Macdonald

A pair of cylinders, crossed at right angles in loaded contact, were used to test oils and gear compounds. The thought was that such a test might be used to predict wear on gear-tooth surfaces when similar lubricants were used. No comparison was given of results obtained with the test lubricants either in service or on other test equipment.

Lithium Soap-Clay Thickened Lubricating Greases

Lubricating greases consisting of lubricating fluids thickened with a combination of lithium soap and hydrophilic (water loving) clay, according to British patent 794,882, are characterized by superior antiwear and load carrying properties.

The lithium soaps may be either preformed or made in situ from long chain fatty acids or from fats.

Colloidal attapulgite, containing 32.4 per cent volatile matter is used in all of the examples. Whatever the clay used it is not treated to confer organophilic properties as it is considered that the lithium soap gives this property.

The weight ratio of soap to clay should be between 1:6 and 1:2.

A typical lubricating grease was made by charging to a pressure vessel:

43.4 lbs. mineral oil having a viscosity SUS of 100 at 100° F.

5.4 lbs. Colloidal Attapulgite on a volatile free basis

1.22 lbs. hydrogenated soybean fatty acids

.18 lbs. lithium hydroxide

.55 lbs. water

This mixture was heated and agitated at 310°F. for 30 to 60 minutes under a pressure of 70 psi. The resulting slurry under pressure was then passed through a high pressure homogenizer at 5000 psi and into an open vessel for cooling.

This product, containing 10.8 per cent dry clay, had penetrations of 262 unworked and 280 worked, a dropping point above 500°F., and carried a load of 70 kg with a 1.1 mm scar after 5 minutes on the 4-ball apparatus.

Process for Preparation of Lubricating Greases with Clay Thickeners

A direct transfer process in which the aqueous colloid is mixed directly with a lubricating oil in the presence of a surface-active agent is described by British patent 794,711. Lubricants so formed are said to be free from "slumping" which does occur if the product is formed by replacing the water with a solvent previous to mixing with lubricating oil. "Slumping" is considered to be settling of the lubricating grease in a bearing housing during quiescent periods, thus exposing part of the bearing to metal-to-metal contact when subsequently operated.

The preferred thickener used in this process is clay and the surface-active agent is preferably a cationic one such as an amido amine of a polyalkylene polyamine. The clay is mixed with water in a proportion so that 0.25 to 3 per cent by weight of the solid is present. Also a strong mineral acid, such as phosphoric acid, is mixed with the clay suspension, in a proportion of 4 to 20 per cent of the solid, before the surface-active agent is added.

The procedure for manufacture of the lubricating grease consists of mixing a clay slurry, which has been treated with acid, with a surface-active agent in liquid form and adding to the mixture a hydrophobic (water-hating) lubricating oil while maintaining a turbulent flow and a temperature of 150 to 250°F. This results in a mass of oily curds and free water. This mixture is passed over a perforated surface,

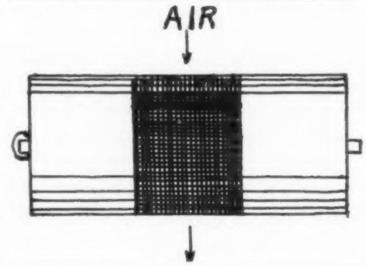


FIGURE 1

such as the screens shown in Figure 1, where the free water is separated. Finally, the wet oily curds in the form of a film are passed over a surface having a skin temperature between 320 and 370°F. for a period between 1 and 30 seconds under turbulent flow conditions, the film

being between 0.005 and 0.03 inch in thickness. This results in a substantially anhydrous lubricating grease.

Thus, a slurry of water and crude Hectorite clay was passed through a cyclone separator to eliminate the gangue. This left a mixture of 2 per cent by weight of clay in water to which was added 7 per cent by weight, based on the dry clay, of phosphoric acid. After the slurry was heated to 200°F. the clay was modified by the addition of 60 per cent by weight, based on dry clay, of surface-active agent and 18 parts by weight, based on the weight of clay, of hot (200°F.) lubricating oil. The surface-active agent used in this case was a condensation product of epichlorohydrin and ammonia wherein one-third of the amino groups were converted into amide groups by reaction with tall oil acids.

The above mixture was passed through a pipeline under turbulent flow conditions for 0.1 seconds before passing down an incline to a screen rotating at 15 rpm. Here water which has separated from curds fell through the screen. The curds, which consisted of oil, clay, surface-active agent and some water, passed continuously into a vertically positioned tube in which a skin temperature of 350°F was maintained. Concentrically positioned vanes, rotating at 1800 rpm resulted in a turbulent film 0.02 inch thick which in 20 seconds required no further milling and had a micropenetration of 220 dmm.

Catalog of Technical Reports—Greases and Lubricants 1939-58

This 4 page catalog, listing available reports of investigations by governmental agencies, can be secured from the Office of Technical Services (OTS), U. S. Department of Commerce, Washington, D. C., for 10 cents in cash. Over 50 of the titles listed concern lubricating greases. While many articles are available in a paper bound form, others can only be obtained on microfilm or photostat.

People in the Industry

Warren Elected President

Glenn B. Warren, vice president and consulting engineer of the turbine division, General Electric company, has been elected president of the American Society of Mechanical Engineers.

ASME Secretary O. B. Schier made the announcement following official tabulation of the members' vote ballots.

Elected to serve with Mr. Warren were five vice presidents. They are: Charles H. Coogan, Jr., head of the mechanical engineering department of the University of Connecticut; Gordon R. Hahn, assistant chief mechanical engineer for Gibbs and Hill, New York; John W. Little, president of the Goslin-Birmingham Manufacturing company, Alabama; Thomas J. Dolan, head of the department of theoretical and applied mechanics at the University of Illinois; Harold Grasse, partner in Black and Veatch, Kansas City, Mo.

In addition, Arthur M. Perrin, president of National Conveyors company, and Richard G. Folsom, president of Rensselaer Polytechnic Institute, were elected directors of the 50,000-member Society. All the electees will take office at the business meeting on the first day of ASME's annual meeting in New York, December 1-5.

A-D-M Elects Officers

The board of directors of Archer-Daniels-Midland company elected a new chairman of the board, president and executive vice president of the nationwide concern.

Thomas L. Daniels, president of ADM since 1947, was named chairman of the board.

John H. Daniels, formerly vice president and manager of ADM's formula feed division, was elected president and chief executive officer.

Richard G. Brierley, formerly vice president and manager of the alfalfa division, was named executive vice president.

The new top executives were announced following the company's annual stockholders' meeting. All other officers were re-elected by the board. At the stockholders' meeting, all directors were re-elect-

ed except Grant Keehn, New York, who retired from the board.

In assuming the presidency of ADM, John Daniels is the third generation of his family to head the company, one of America's leading processors of agricultural commodities.

His grandfather, John W. Daniels, founded the Daniels Linseed company in Minneapolis in 1902 and remained as president until 1924. Daniels Linseed company became Archer-Daniels Linseed Company, from which ADM was formed in 1923. John Daniels' father, Thomas L. Daniels, has headed the company since the death of Shreve M. Archer in 1947. The new president thus is only the fourth chief executive officer in the company's 56-year history.

B. G. Symon of Shell Oil Company Named General Sales Manager of International Lubricant Corporation

B. G. Symon, manager of Shell Oil company's industrial products department, has been named general sales manager for International Lubricant corporation, New Orleans.

International Lubricant corporation is a subsidiary of Shell. It manufactures and compounds greases and lubricating oils for Shell and the general trade.

Mr. Symon, who has served for several years as director of this corporation, will begin his new duties in New Orleans on or about December 1.

Mr. Symon was recently awarded a service emblem during a ceremony at Shell's head office, New York, in recognition of his 30 years' service with the firm. A native of Brookfield, Mo., and a mechanical engineering graduate from the University of Missouri, Mr. Symon began his career with Shell in 1928 as assistant to the manager of the lubricants department in St. Louis.

In 1940, he moved to New York as manager of the technical products department, and was named manager of the lubricants department two years later.

He was named to his present position in August 1955.

Mr. Symon is an active member of the American Petroleum Institute, a director of the National Petroleum Association, and is a past president and former director of the National Lubricating Grease Institute.

Aro Announces Promotions In Lube Department

New promotions within the sales department of the lubricating equipment division of the Aro Equipment corporation, Bryan, Ohio, were announced by Ralph W. Morrison, vice president and director of marketing. C. A. Stutzman, sales manager, has been transferred to Aro Equipment of California. His headquarters will be at the Aro of California branch in Los Angeles and he will be in charge of lubricating equipment sales on the West Coast. Hal F. Freyer, formerly in charge of the New York branch, has been promoted to general sales manager at Aro's main office in

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Representative—S. A. Bennett

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Republic Steel Corporation
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Representative—R. Abarno

Sumner Sollitt Co.
307 N. Michigan Ave., Chicago 1, Illinois
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The Farval Corporation
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Representative—Lee Witzenburg

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60 Northeast 11th Ave., Minneapolis 13, Minn.
Representative—B. A. Beaver

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Representative—G. A. Hubbard

Stewart-Warner Corporation
Alemite Division
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Representative—E. G. Wicklatz

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Representative—E. W. Baumgardner

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Representative—Hal U. Fisher

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Montreal, Quebec, Canada
Representative—M. E. Wight

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420 West Douglas, Wichita, Kansas
Representative—W. B. Neil

D-X Sunray Oil Company
Mid-Continent Bldg., P. O. Box 381, Tulsa, Okla.
Representative—J. W. Basore

Farmer's Union Central Exch., Inc.
P. O. Box G, St. Paul 1, Minnesota
Representative—H. F. Wagner

Illinois Farm Supply Company
100 East Ohio Street, Chicago, Illinois
Representative—S. F. Graham

Ohio Farm Bureau Cooperative Association, Inc.
245 North High Street, Columbus 16, Ohio
Representative—Walter N. Callahan

Valvoline Oil Company
Division of Ashland Oil & Refining Co.
Box G, Freedom, Pennsylvania
Representative—D. A. Smith

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Representative—David F. O'Keefe

Girdler Process Equipment Division, Chemetron Corp.
P. O. Box 43, Louisville 1, Kentucky.
Representative—J. E. Slaughter, Jr.

Manton-Gaulin Mfg. Co., Inc.
44 Garden Street, Everett 49, Massachusetts
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Representative—D. H. Putney

Struthers Wells Corp.
1003 Pennsylvania Ave. West, Warren, Pa.
Representative—K. G. Timm

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Representative—B. H. Loper

American Potash & Chemical Corp.
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Representative—W. F. O'Brien

Archer-Daniels-Midland Company
Chemical Products Division
P. O. Box 532, Minneapolis 40, Minn.
Representative—J. H. Kane

The Baker Castor Oil Company
120 Broadway, New York 5, New York
Representative—J. W. Hayes

Baroid Chemicals, Inc.
A subsidiary of National Lead Company
1809 South Coast Life Building
Houston 2, Texas
Representative—Mr. C. M. Finlayson

Godfrey L. Cabot, Inc.
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Representative—H. P. Donohue, Jr.

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Representative—R. K. Smith

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Representative—W. G. McLeod

Humko—Chemical Department
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Memphis 7, Tennessee
Representative—W. J. O'Connell

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Representative—Malcolm M. Moore

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Representative—J. L. Palmer

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2nd & Mallinckrodt Sts., St. Louis 7, Missouri
Representative—D. B. Batchelor

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Cleveland 15, Ohio
Representative—W. A. Ritchie

Metasap Chemical Company
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Representative—T. J. Campbell

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165th & Indianapolis Blvd., Hammond, Ind.
Representative—F. H. Beneker

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Vopcolene Division
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Laboratoires de Recherches Purfina S.A.
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Bruxelles (N.O.H.), Belgium
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Veresit—Fabrica de Productos Quimicos S.R.L.
Monasterio 271, Buenos Aires, Argentina
Representative—Dr. Alexander Erdely

Bryan. John J. LeVan, formerly supervisor of farm sales, has been promoted to manager of the New York branch.

Mr. Stutzman came to Aro in 1947 after 22 years' service with a major oil company. He was Aro's New England division manager for five years and was then named western regional manager. Later, he was made sales manager at the Home Office in Bryan, Ohio.

Mr. Freyer had many years' experience in the automotive service field when he came to Aro in 1950 as Mid-West regional manager. He later became assistant sales manager, handling national representation. His extensive experience helped him gain a thorough grasp of the company's marketing operations. A contributing factor in his recent promotion was the outstanding sales record he achieved as Manager of the New York Branch, as well as a keenly developed insight into major oil and automotive distributor equipment problems.

Mr. LeVan, who succeeds Mr. Freyer in New York, served in the Air Force during World War II and completed his college education after returning from service. Before coming to Aro early in 1957, he was a sales representative for a nationally known farm machine manufacturer. He worked closely with dealers, distributors and jobbers on the Atlantic seaboard, and supervised all sales promotion activities in this area. For the past 18 months, he has been supervisor of Aro's farm lube equipment sales. Additional training and field experience have given him a knowledge and understanding of the automotive market.

Burns Accepts Oil Congress Presidency

H. S. M. Burns, president of Shell Oil company and chairman of the board of directors of the American Petroleum Institute, has accepted the presidency of next year's meeting of the World Petroleum Congress, it was announced by the Congress secretariat today.

As Congress president, Mr. Burns will preside at the more important functions planned for the meeting.

The Congress, the fifth to be held in the past quarter century, is scheduled for New York May 30-June 5, 1959, and is expected to draw 5,000 to 6,000 executives, scientists and technologists from 50 countries.

Emery Appoints Nelson

Appointment of Albert A. Nelson as commercial research manager of Emery Industries, Inc., has been announced by Lee F. Church, controller. He will conduct market studies, sales analysis, and profit and pricing studies.

Before joining Emery, Mr. Nelson conducted sales research for the Gibson Art company. He also has been a buyer for the Procter & Gamble company and is active with the American Marketing association.

Industry News

First ASLE Gear Symposium To be Held in Chicago

The important relationship between modern gear design and gear lubrication will be the theme of the first annual ASLE Gear Symposium to be held in Chicago on January 26-27, 1959. The gear and gear lubrication committee of the American Society of Lubrication Engineers announces the Morrison hotel in Chicago to be the site of this first symposium specifically planned to add to the knowledge available to the field of gear design and gear lubrication.

The symposium will be devoted to three principal areas of discussion. These are: spur gear lubrication; extreme pressure lubricants and hypoid gearing; and boundary lubrication. Twelve papers will be presented at four planned sessions. These papers will be presented by some of the country's outstanding specialists in the field of gear lubrication. Among them will be the winner of the 1958 ASLE national award, Mr. Earle Ryder, whose paper is entitled "The Gear Rig as an Oil Tester."

Alpha-Molykote Releases Newsletter No. 5

Lubrication newsletter No. 5, a technical paper covering the effect of lubricants on the "wear in" of new machinery, has been released by the Alpha-Molykote corporation, Stamford, Conn.

A thorough engineering study of the surface geometry of mating surfaces is included together with a discussion of Coulomb's theory on friction as it applies to the ever-present asperities on machined surfaces.

The results of a continuing series of tests on the lubrication of mating surfaces reveal data heretofore unpublished. Test equipment especially developed for this use is thoroughly described. Actual test records are pictured and analyzed.

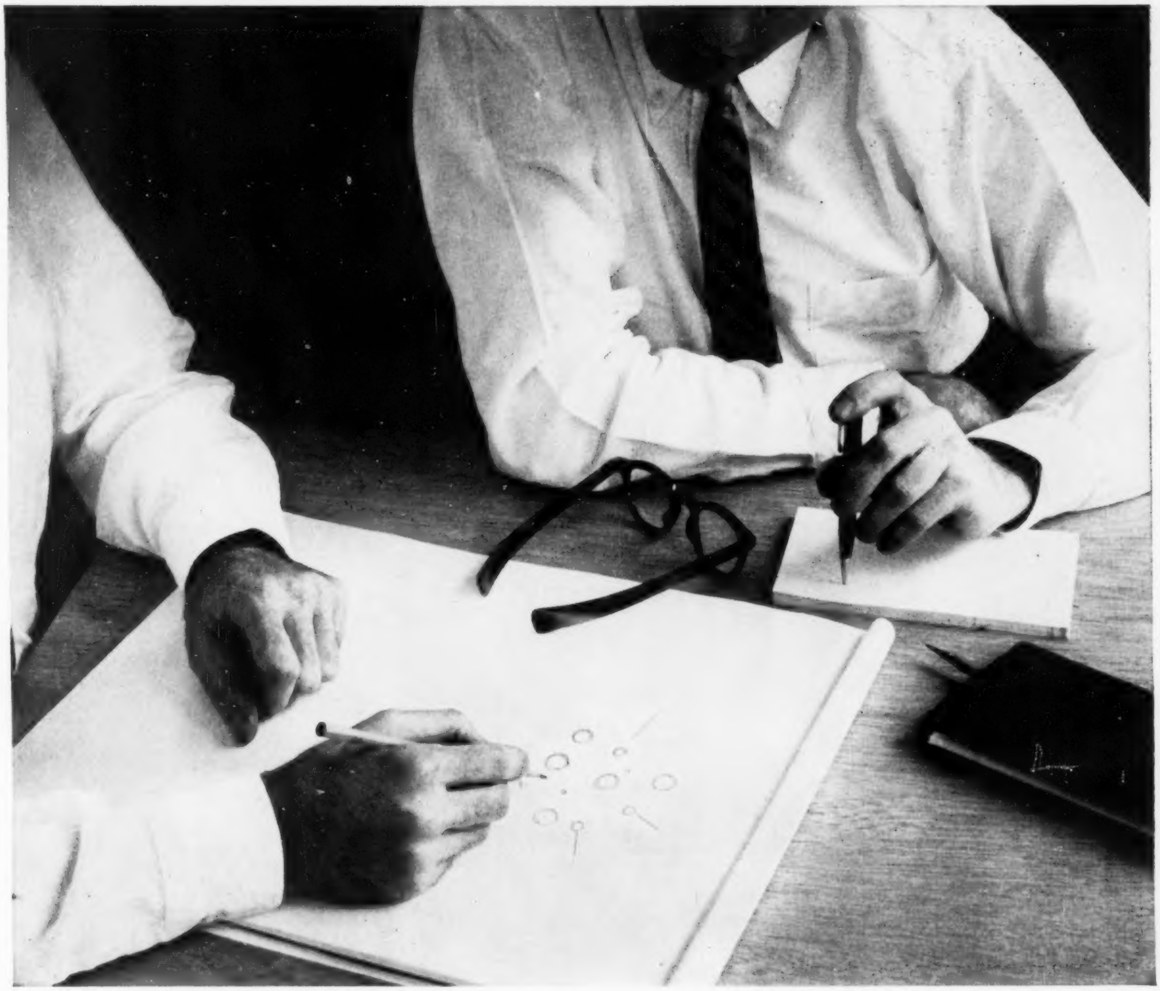
Copies of Lubrication newsletter No. 5 are available from the Alpha-Molykote corporation, 65 Harvard Ave., Stamford, Conn.

New "Mini-Ram" Pressure Primer Introduced By Lincoln

A new air-operated pressure primer is offered with air-operated pumps to dispense heavy lubricants, putties, mastics, sealers, coatings, etc., direct from original five-gallon, 25 to 50 lb. containers by Lincoln Engineering. The system is completely sealed against contamination by dirt or air.

The manufacturer states that a maximum power of 1500 pounds dynamic pressure is applied to the surface of the material. An elevator is raised by air power so the bucket of material can be set in place easily. The newly developed follower wipes the sides of the container right to the bottom — no waste.

Construction is rugged — construction is of cast iron and steel. For more information ask for Bulletin 683 from Lincoln Engineering division of the McNeil Machine & Eng. Co., 5702-30 Natural Bridge avenue, St. Louis 20, Mo.



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You can share in this living reality by investigating the possibilities of using lithium in *your* product or process. Your queries will be reviewed by men who know the facts and know a good bit about applying them. An ideal way to get your investigation started is to write for *Chemical and Physical Properties of Lithium Compounds*. This informative data book is available on request to Technical Literature Department, Foote Mineral Company, 402 Eighteen W. Chelten Bldg., Phila. 44, Pa.

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